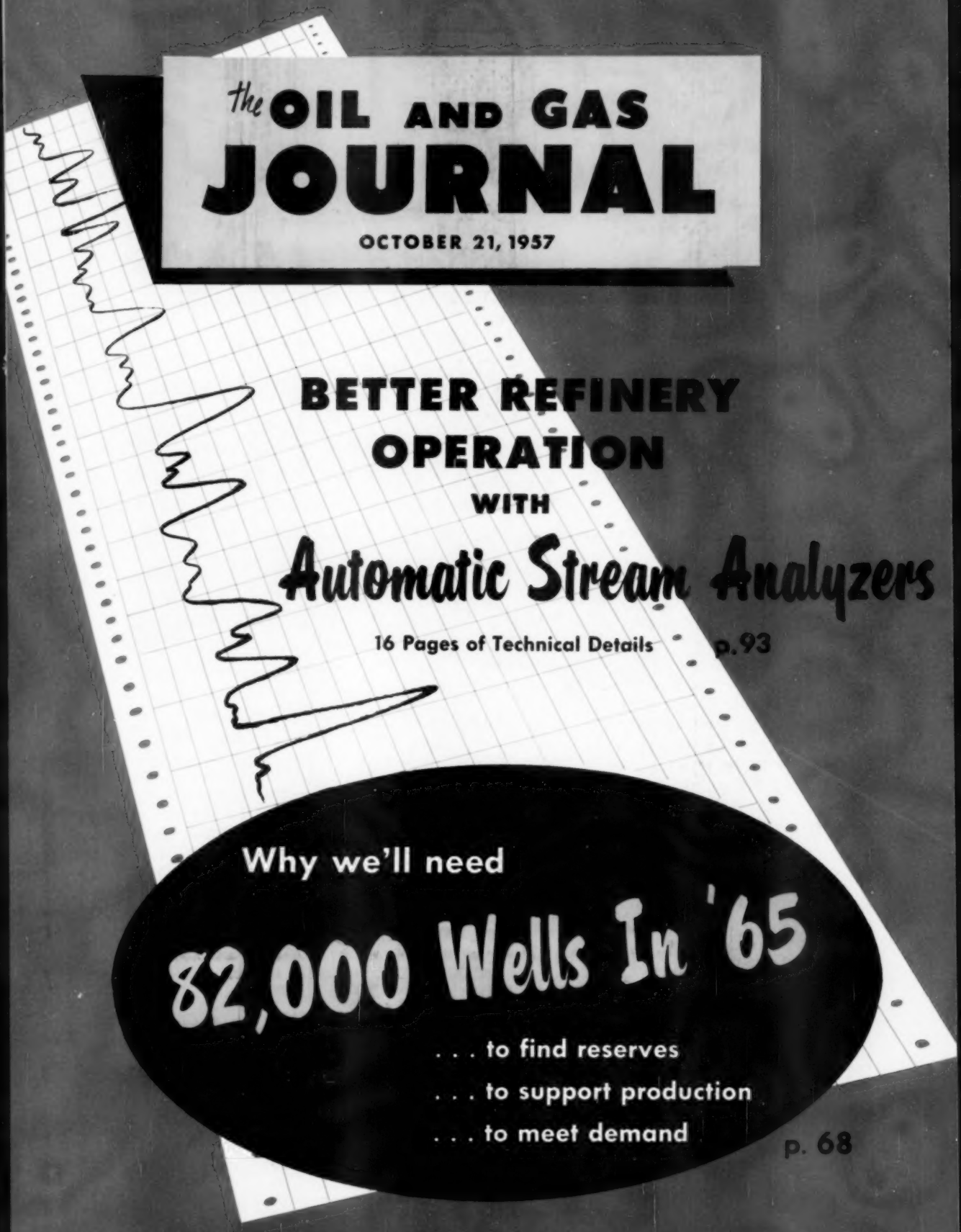
the OIL AND GAS JOURNAL

OCTOBER 21, 1957



BETTER REFINERY OPERATION WITH Automatic Stream Analyzers

16 Pages of Technical Details p. 93

Why we'll need

82,000 Wells In '65

. . . to find reserves

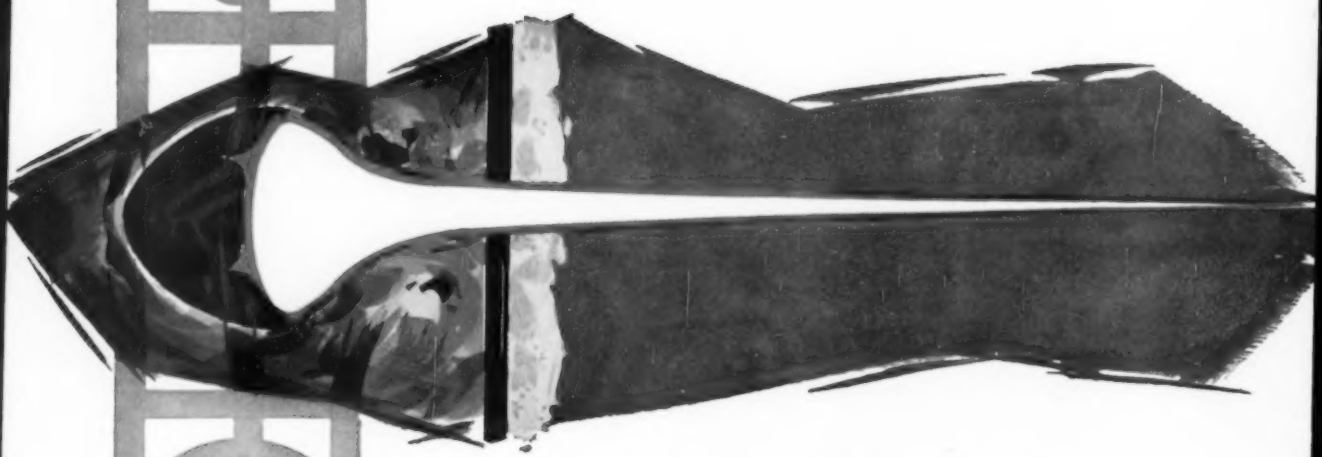
. . . to support production

. . . to meet demand

p. 68

Complete Perforating Service

You can get perforating Results... where everything else has failed...



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the OIL AND GAS JOURNAL Newsletter

Oct. 21, 1957
Tulsa, Okla.

Long-term outlook for drilling still is good:

Looking beyond the present so-so year for drillers, oil economists reaffirm their faith in this picture:

...Demand to meet needs of growing population and industry and keep up reserves will require tremendous amounts of oil and gas.

Producers must find and develop 45 billion barrels of liquids and 184 trillion cubic feet of gas in next 9 years.

...Drillers to meet this program must drill 62,700 wells next year. This will step up yearly to 82,300 by 1965.

That's even more drilling than these figures reveal because tomorrow's wells are all going deeper (p. 68).

The market for new rigs, naturally is soft now. There's an oversupply of equipment prevailing.

But a Journal survey (p. 65) shows these interesting facets on buying plans of contractors:

...Most drillers don't plan to buy complete new rigs unless there's a big upturn in drilling. Even this won't mean a boom until deep drilling spurts. Then demand for new equipment will jump.

...Trend now is toward keeping old rigs in good order by replacing with new components and parts.

...Foreign drilling is proving attractive to many bigger drillers. Their demand for new and heavy equipment has boomed export sales of supply firms. This foreign trade has offset slow domestic sales for some suppliers.

Reports on penetration-rate tests were handed A.A.O.D.C. members at their Tulsa convention last week. Results show:

A 50 per cent increase in weight will give about a 65 per cent increase in drilling rate.

Low rotary speeds permit bit teeth to use available weight better than high speeds.

Louisiana's exploration picture remains bright. Gas is the big reason.

Oil discoveries through first three quarters are lagging behind year ago, roughly paralleling the 15 per cent drop in wildcat completions.

Gas discoveries are on a par with 1956, running about 2-to-1 over oil discoveries.

Unlike crude, gas in large quantities has a ready sale in South Louisiana.

Oil men will find the royalty on some Indian lands up. New ruling by Secretary of the Interior allows certain tribes to alter the prevailing one-eighth royalty to any figure of their choice.

First result: Remaining lands in Aneth sector of San Juan County, Utah, will carry one-sixth royalty when they are put up for leasing next February.

Alaskan leasing has skyrocketed since Richfield's oil strike on the Kenai Peninsula.

More than 3,055 applications have been filed in Anchorage for leases covering 9 million acres. Alaska now has more than 12 million acres under lease. Latest leasing is centering in the Kateel River and lower Kuskowim River areas.

Richfield has been delayed in starting another Kenai test while a federal bureau draws up regulations for drilling in the moose reserve. Humble and Shell plan to drill throughout the winter at their joint Bear Creek Unit, 5 miles inland from Shelikof Strait across from Kodiak Island.

European capitals buzz with persistent rumors that Jersey Standard has teamed with the French oil colossus, Cie. Francaise de Petroles, for a deal in the Sahara.

Jersey Standard people in this country say only that they have not yet signed anything with anyone for prospecting rights in the Sahara.

There's enough smoke to indicate a fire. Definite line on the deal should come before Algerian spring bidding.

The Japanese have run into trouble with their publicized project to get an oil exploration concession in Saudi Arabia.

The trouble is simply money. Japanese industrialists and bankers agreed to pay Saudi Arabia an initial bonus of about $5 million and back this up with a $10-million exploration program.

Now leaders of the syndicate are having trouble getting individual Japanese utilities and industrialists to put up the promised cash. The businessmen want something more definite from Saudi Arabia before parting with their money.

New wage programs of Oil, Chemical and Atomic Workers International Union may include a cents-per-hour floor.

Unionists in the Pennsylvania Grade areas are urging the change. They've told union chiefs in Denver men in the lower-paid locals keep falling behind in each wage campaign. Pennsylvania locals in the 1957 settlement for 6 per cent pay hikes lagged others by 4 or more cents an hour.

These lower paid men want a minimum based on average pay in the industry written into new contracts.

Natural-gasoline men are closely watching the new Houston plant of Oil & Chemical Products. It's the first installation to include reforming, solvent extraction, and isomerization in one complete package.

Plant's real significance, however, is this: It offers natural-gasoline men chance to offset none-too-rosy sales outlook. Natural gasoline has been left behind in the octane race.

The new processing package will permit processor to sell benzene and other solvents at high per-gallon return, offer isopentane to refiners for blending, or sell a high-octane, natural-gasoline raffinate, also desirable for blending.

A change appearing in auto-paint practices may affect refiners.

Lincoln is due to spray its 1958 models with a water-emulsion type paint. If this catches on throughout the auto industry, it would put a dent in the profitable solvents market now being supplied by refiners.

Look for an established East Coast refiner soon to announce addition of a new coking unit. This is flying against the trend in most areas where new coking units have been deferred because of the strong position of heavy fuel.

But another coker on the East Coast will tend to defer any plans neighboring refiners may have for similar operations. One coker can take a lot of heavy fuel oil off the market, giving a firmer local price which makes further coking less economic.

A brisk refining and marketing situation is developing in eastern Canada. Refiners there one of these days may wake up with the same problem now plaguing their U.S. colleagues: Excess refining capacity.

Canadian demand is rising faster than U.S., but refinery construction is more than keeping pace. Irving Oil Co.'s major plant announced for Saint John, N. B., is the latest. But it follows new plants built by British American, Cities Service, Shell, and expansion by others.

Deals are reported in the making involving sale of at least one large crude-gathering system in Oklahoma.

Gulf Oil Corp. reportedly has been approached by pros-

pective buyers for its lines. Texaco also may be willing to sell its system.

Buyers being mentioned include Kerr-McGee, Mid-Continent Pipe Lines, and Rock Island Oil & Refining.

The gas-utility and pipeline industry continues to look good in revenues, dividends, and rate of return.

Total operating revenues of the industry reached $6,051 million for the year ending last June 30. That's a 6.2 per cent gain. Net income dipped from $619 to $618 million.

But average dividend of $1.89 per share was 6.2 per cent above last September. Return of 5.07 per cent was a gain of 7.4 per cent.

Pipeliners will want to watch one West Texas project closely. Welders are using an unusually narrow bevel of 20°.

This departure from the usual 30° bevel is occurring on 33 miles of an 83-mile, 16-in. job for Permian Basin Pipeline near Eldorado. Reason for the narrow bevel: Economy and speed. It requies less metal deposit.

First flow of Canadian gas into its system is opening a new era for Pacific Northwest Pipeline. It could become one of nation's largest transporters of gas as a result.

Its growth is assured by two factors: An important gas supply at both ends of its lines with untapped markets in nation's fastest growing area strung along the way (p. 72).

Pipeliners in Canada may face tighter controls.

Prime Minister Diefenbaker has named a royal commission headed by a Toronto lawyer, Henry Borden. It will review policies to be applied to regulating the transmission of oil and gas between provinces and from Canada to the U. S.

Commission also will make suggestions on pipeline operations, financial structure, and control of corporations.

Pipelines of 55 and 43-in. diameter are being planned.

U. S. Steel is investing $15 million in a 13-mile dual system to move 255,000 M.c.f. daily of byproduct coke-oven gas to plant furnaces. Williams Brothers has the turnkey contract for the project.

The 55-in. pipe is one of the largest ever used for a gas line. Steel pipe up to 80-in. has been used for water lines.

France can have its crude pipeline through Tunisia.

In fact, Tunisian President Bourguiba approves the idea of moving Saharan oil through his country to the Mediterranean. The oil would bolster Tunisian economy.

Bourguiba in an exclusive Journal interview puts one big condition on such a deal: No French troops nor airports can be placed along the line inside Tunisia (p. 86).

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TULSA, OKLAHOMA

86 YEARS OF PROGRESS WITH THE OIL INDUSTRY

the OIL AND GAS JOURNAL

OCTOBER 21, 1957 • VOLUME 55 • NUMBER 42

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The Oil and Gas Journal, published Mondays, copyright 1957, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY—OPERATION

Refining-Processing

SPECIAL REPORT: PROCESS-STREAM ANALYZERS 93-108

Automatic Stream Analyzers 93

By D. J. Fraade

Continuous process-stream analyzers continually monitor operations and detect changes as they occur. This allows adjustments to be made within a very short time when corrective action is called for. However, use of these instruments in process plants requires careful thought in their application at critical places. Here is a rundown on the current status of these instruments and what the future may hold for them.

The Mass Spectrometer in Petroleum Operations 104

By Henry Landsberg

This valuable tool is finding application in a number of places in the oil business. Among these are: (1) petroleum production, (2) sulfur-recovery plants, (3) pilot-plant studies, (4) selective absorption operations, and (5) ammonia production.

Isovapor-Lock Chart for Blending Gasoline 110

By T. W. Legatski and O. C. Bridgeman

This correlation will enable the refiner to take Reid vapor pressure, slope of the A.S.T.M. distillation curve at the 10 per cent point, ambient temperature, and altitude, into consideration in blending work. A new rating scale is defined.

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Bottom-Hole Pressure in Flowing Wells 114

By Dr. John M. Campbell

Part 42 in the series on field processing.

Cathodic Protection System Combats Oil Well Corrosion 122

By G. L. Doremus and J. J. Lawnick

A cathodic protection system has been installed on 48 wells in Waskom field, East Texas, to control external casing corrosion in shallow formations. Both rectifier system and magnesium anodes are used.

Controlled Drill-Stem Torque 127

By Stanley C. Moore

Makeup torque is by far the most important single factor in the performance of rotary shouldered connections. And great care should be taken to assure proper field makeup. Field studies point up the importance of controlled torque.

Pipelining

Supervisory Control of Gas Pipelines 118

By F. Vinton Long

Although the decision for push-button control of pipeline stations must be made on a case-by-case basis, automatic operation will be indicated for a majority of systems. Reduced operating costs and more efficient operation usually result.

Pipeline Patrol: Covering Lines in Creek Beds 141

By Larry Resen

A concrete arch was used by Shell Pipe Line Corp. engineers and maintenance crews to protect an exposed stream crossing of the Rancho Pipeline near Fredericksburg, Tex. Also, planning for safety in cathodic-protection systems.

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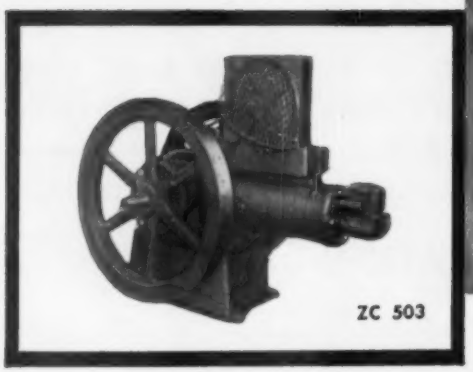
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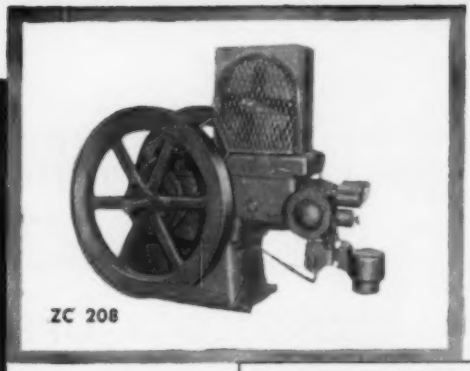
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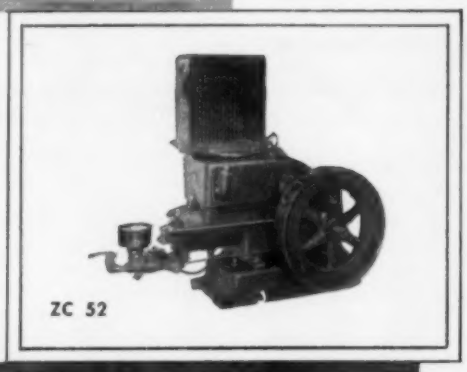
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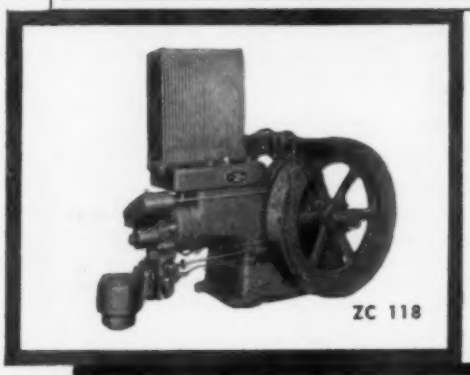
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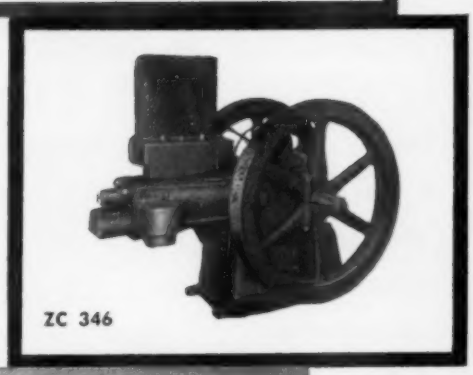
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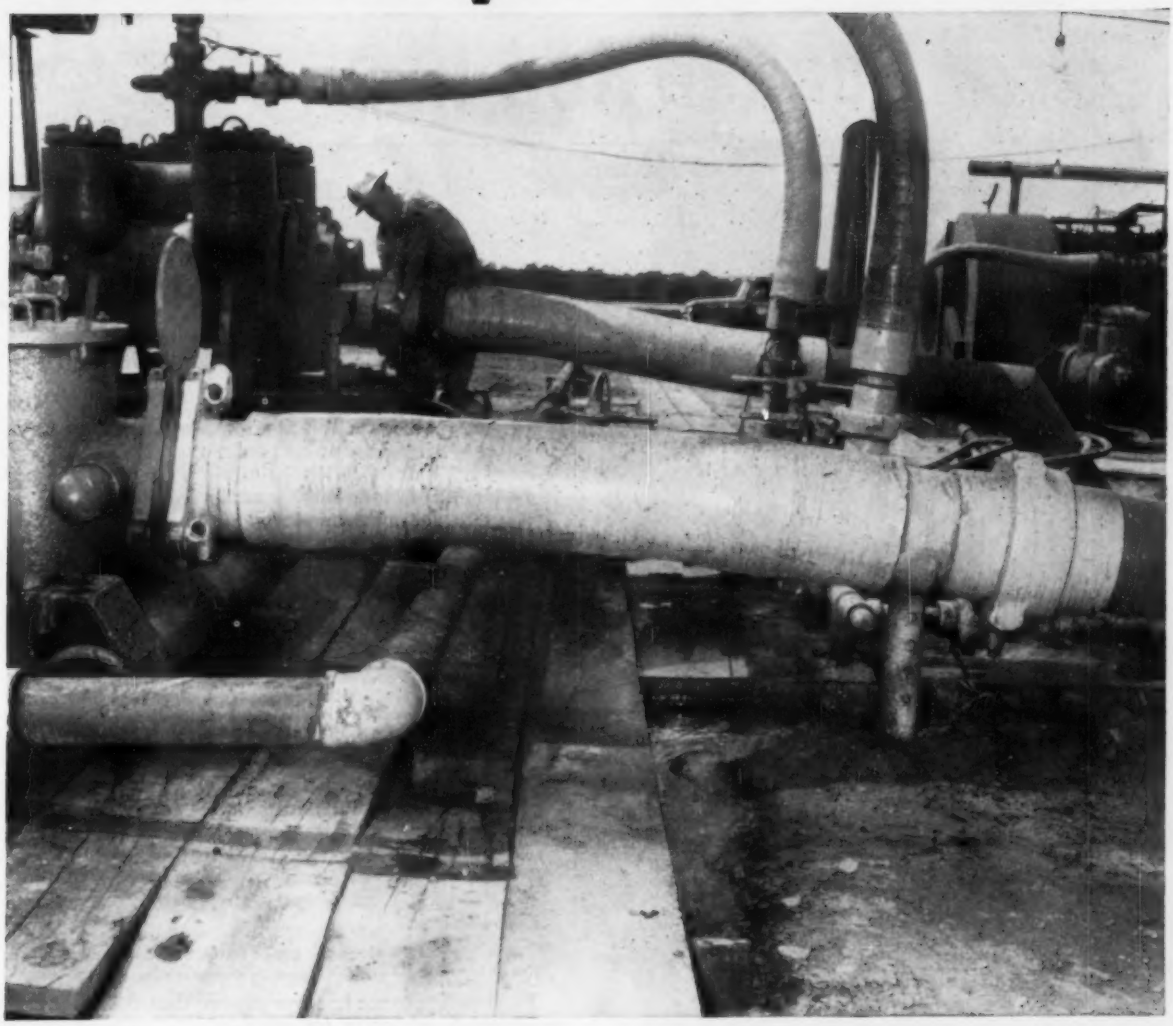

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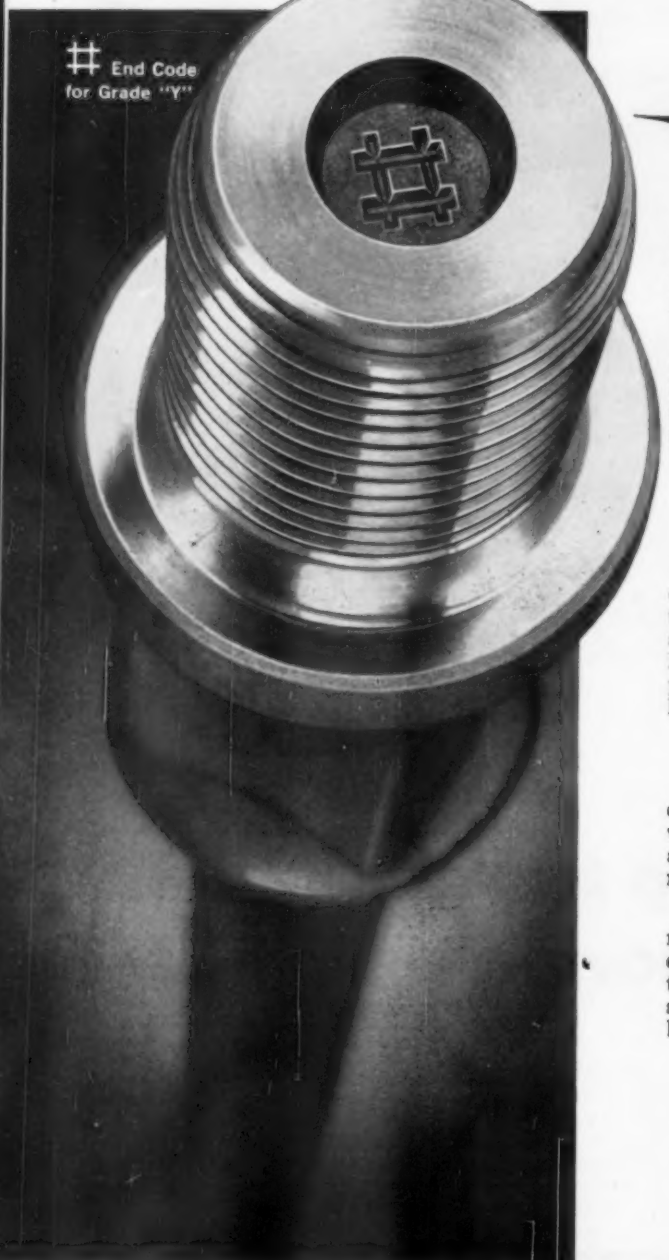

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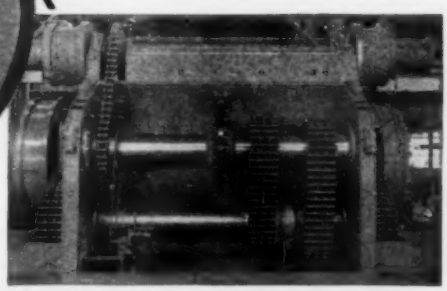

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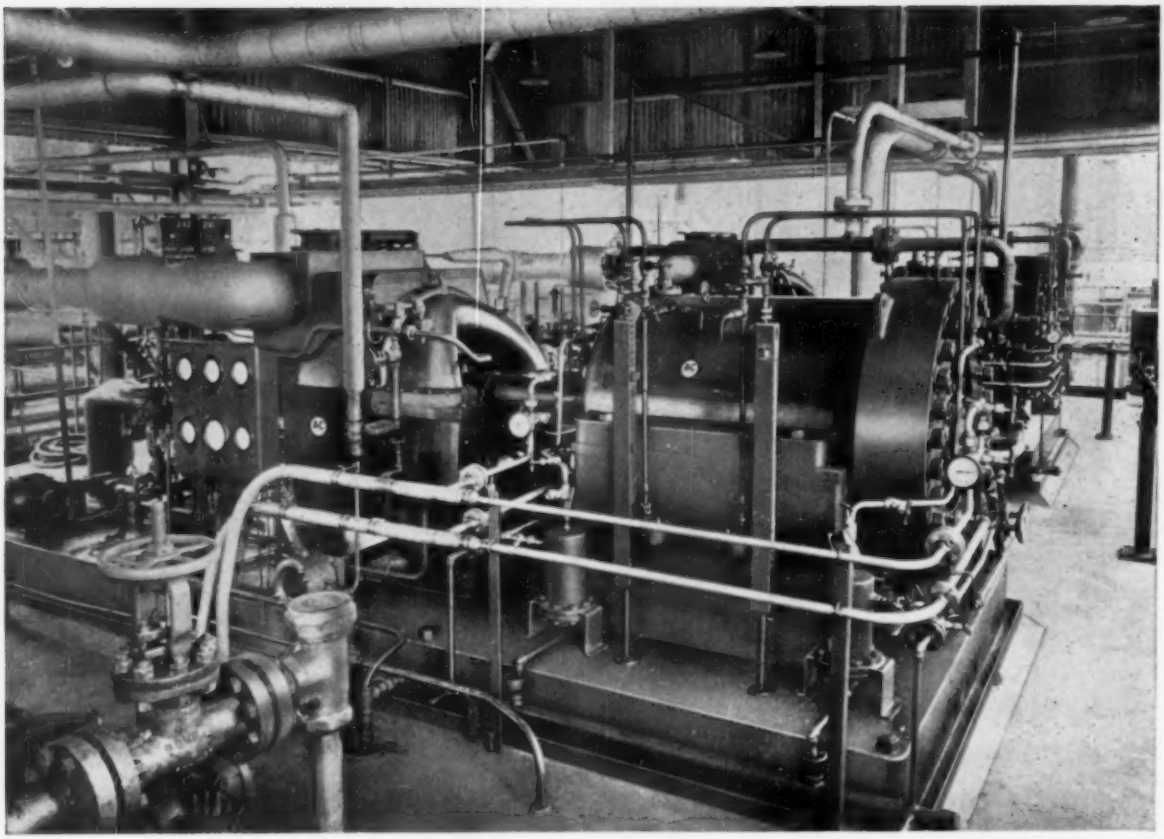

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Gulf Refinery Uses Allis-Chalmers Compressors for Hydrogen Recycling

Two high pressure compressors of the latest Allis-Chalmers barrel-type design are in use at the Gulf Oil Corporation Plant at Port Arthur, Texas.

These units are used in a desulphurization process, in the refining of fuel oil. They are typical of Allis-Chalmers units chosen for upgrading processes.

Allis-Chalmers builds centrifugal, axial, and rotary sliding-vane type compressors for all refinery applications. Contact your nearby A-C office for information about your requirements, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

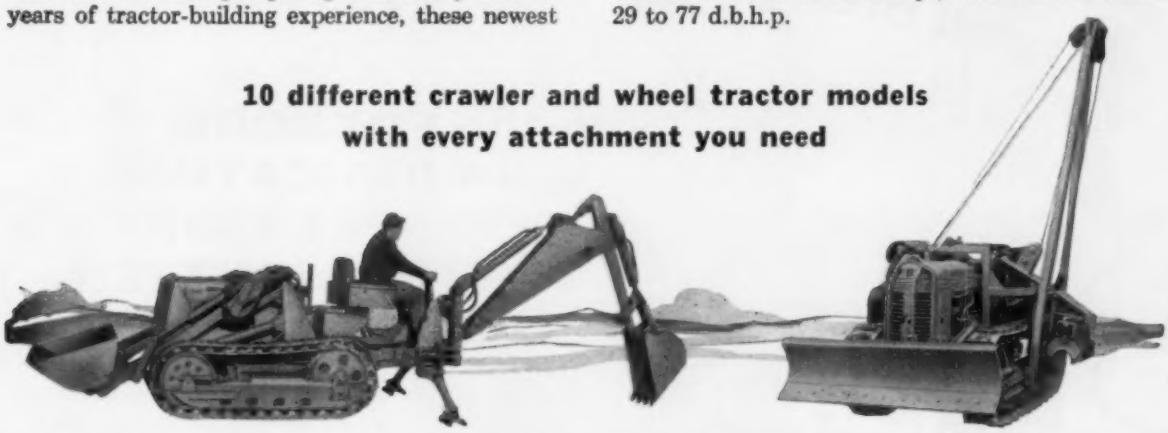
A-5421

WHY OILMEN DEPEND UPON OLIVER

for the rugged jobs...for lowest costs

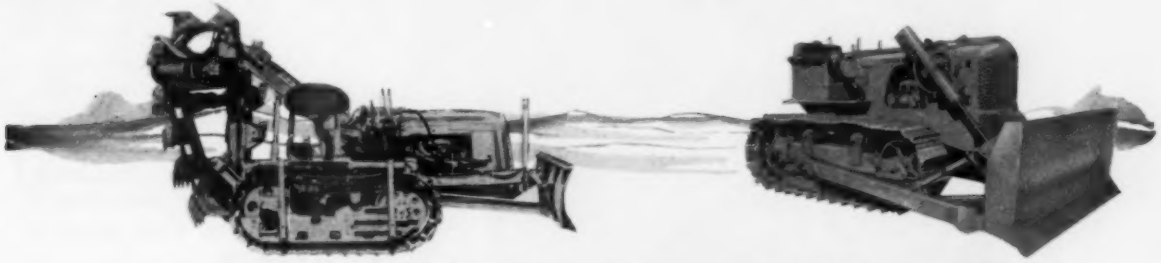
• In the oil fields, along the pipelines and in refineries all across the country these Olivers have proved that they have what it takes to get jobs done on time—and without pampering. Backed by over 50 years of tractor-building experience, these newest Olivers have the ruggedness, the versatility and the job-speeding features that put you ahead of competition on any assignment. Crawler tractors range from 21.8 to 133 drawbar h.p.; wheel tractors from 29 to 77 d.b.h.p.

10 different crawler and wheel tractor models with every attachment you need



OC-46 LOADER WITH JET-TRENCHER—21.8 drawbar h.p.; ¾-yd. loader bucket. Jet-Trencher is mounted or removed in 90 sec.

"LITTLE BOOMER"—2000-lb. lifting-carrying capacity. Also mounts dozer, pipe bending shoes, winch, etc. Model OC-12 side boom handles 13,000 lb.



UNIVERSAL TRENCHER—digs up to 4′ deep and 18″ wide; 8 digging speeds. Hydraulic control with all features for low-cost trenching.

OC-12 WITH POWER-TURN STEERING—53 d.b.h.p.; available with dozer, angleblade, side boom and other attachments.

SUPER 88 HYDRO-TRENCHER—a fast-working ½-yd. back hoe, digs to 12′ depth. Dual hydraulic control provides smooth, efficient production. Also converts as shovel.

SUPER 55—sized for hundreds of jobs; 6 travel speeds; available with a full complement of attachments for lifting, loading, carrying, digging, etc.

Ask your Oliver distributor to demonstrate or write for literature.

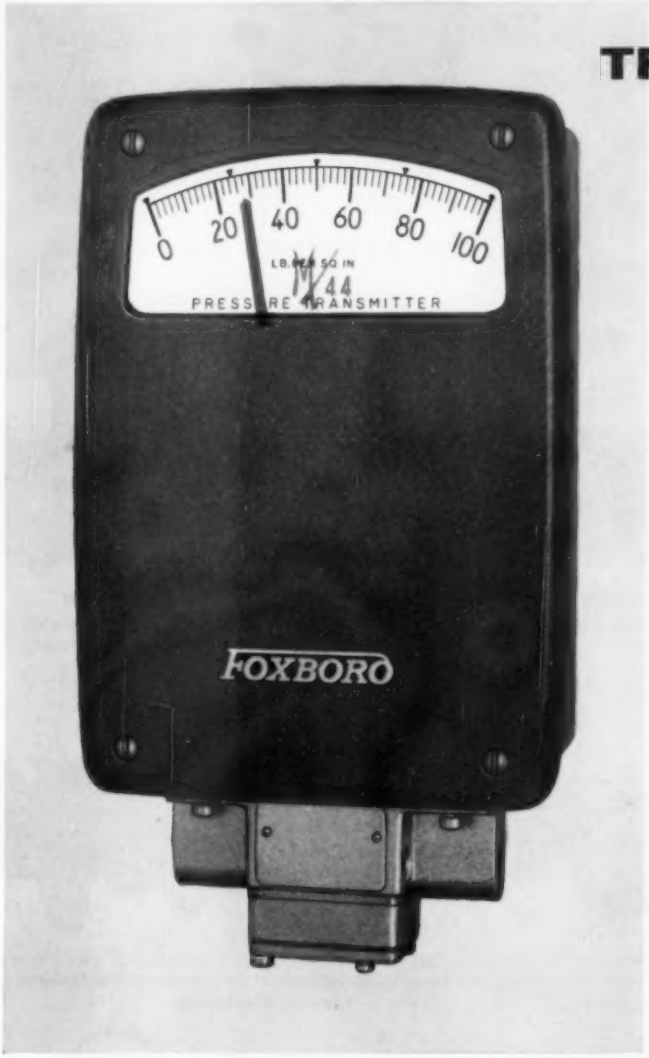
THE OLIVER CORPORATION
400 West Madison Street, Chicago 6, Illinois

OLIVER

A complete line of industrial wheel and crawler tractors and matched allied equipment

read pressure up to 20 ft. away!

on the FOXBORO M/44 INDICATING PRESSURE TRANSMITTER



You can check pressure readings at a glance on the Foxboro Pneumatic Indicating Pressure Transmitter. Its open-face, horizontal, 4-inch indicator scale and eye-catching red pointer are clearly visible as far away as 20 feet.

But high readability is just part of the story. Actually, this instrument was engineered from the ground up. Makeshift arrangements have been eliminated, hung-on gauges are gone. Everything is included in one, neat, ready-to-install package.

Because the indicating pointer is direct-connected to element and transmitter, calibration is easy . . . and you can re-zero the transmitter externally. All M/44 components are standard, performance-proved Foxboro parts. This makes it easier to stock and service.

From its compact, drawn-steel case to its tough, polyester plastic cover the M/44 is the high-efficiency, low-cost pressure transmitter for centralized control and operation. All standard ranges.

Write for complete details. **The Foxboro Company, 6010 Neponset Ave., Foxboro, Mass.**

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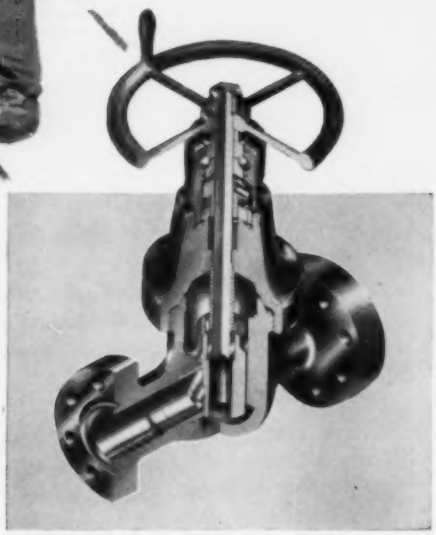
INSTRUMENTATION FOR INDUSTRY

Only the beginning . . . years of service ahead



BIW non-lubricated gate valves

You know that you can install them and forget them. More than 35,000 BIW Valves in the field prove that. The design of the valve is so simple that there is nothing to get out of kilter, nothing to require attention. Best of all, the human element can be almost forgotten, for the BIW Valve does not require lubrication ever. The tight metal-to-metal seal is permanent and is always ready to seal tightly.

The BIW Valve is as easy to operate as it is positive. Only 25 foot-pounds of torque are required to open or close the 2½ in., 10,000 lb test valve against 5,000 psi pressure. And when it's closed you know it will hold.

ALCO specialists will show you the complete BIW Christmas tree with proved BIW Non-Lubricated Gate Valves.

Write or call Petroleum Industry Equipment Division, Department BV-1, Bank of the Southwest Building, Houston 2, Texas.

ALCO

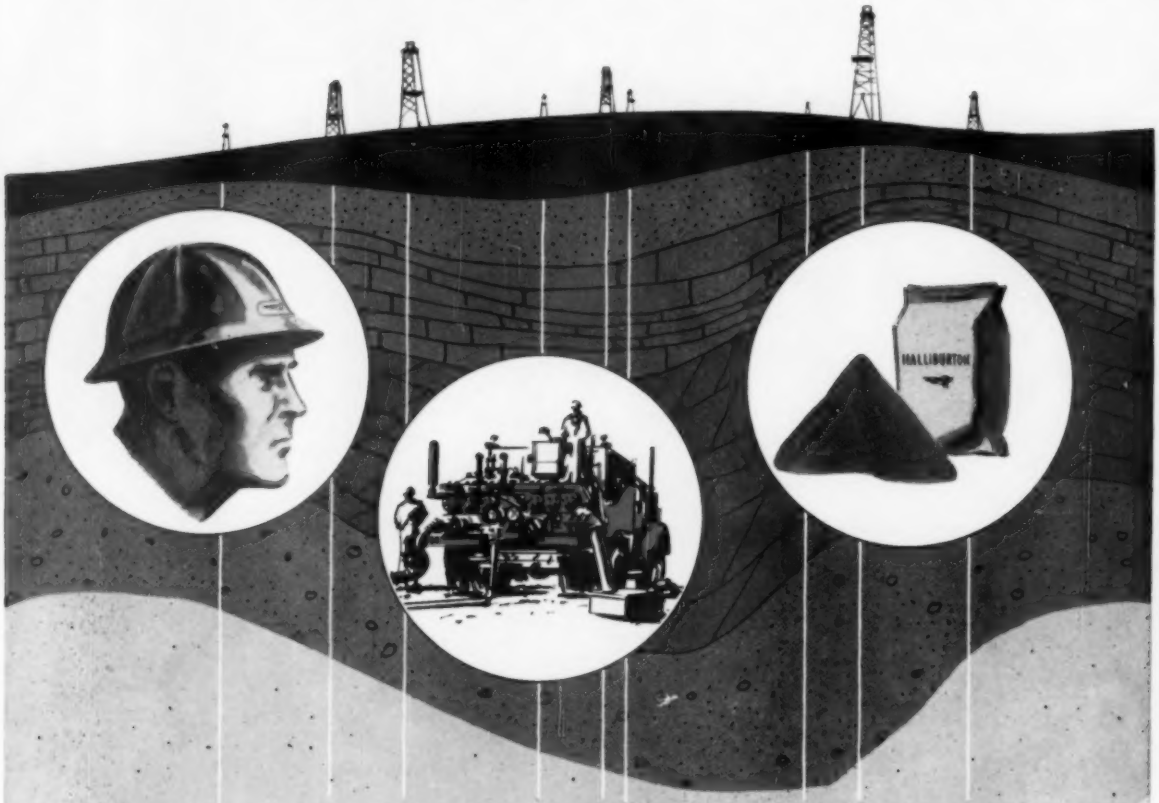
ALCO PRODUCTS, INC.

NEW YORK

Sales Offices in Principal Cities

FOR CUSTOM-CONTROLLED CEMENTING...

specify HALLIBURTON!



Two wells in the same field, drilled to the same depth, may require altogether different cementing techniques. In each case, protecting the reservoir and guarding against corrosion and contamination demands top men, equipment and materials.

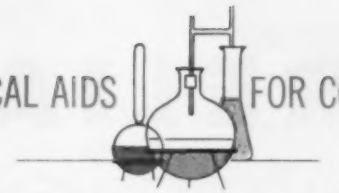
Before a Halliburton cementing job begins, a well's downhole conditions are analyzed. Thoroughly trained Halliburton technicians, utilizing specialized tools and cementing equipment, employ a wide range of laboratory-developed chemical additives to formulate the exact cement slurries needed for your well's individual requirements.

These are some of the reasons the industry looks to Halliburton to handle the problem wells, the out-of-the-ordinary wells that call for the best in cementing. This same custom-controlled cementing by Halliburton can mean longer well life and greater net production for your well too.

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

HALLIBURTON'S CHEMICAL AIDS  FOR CONTROLLED CEMENTING...

ADDITIVE	TYPE OF CONTROL	DESCRIPTION
HR-4	A cement retarder, used in portland or Pozmix Cement to retard the set, allowing placement at high temperatures.	A small amount added to dry cement or in the mixing water provides a tailored composition for cementing in the deepest of wells.
HR-7	A cement dispersant and retarder, effective in obtaining smoother and more fluid cement slurries.	For use with high gel cement compositions; most applicable in wells of moderate temperatures.
HI-DENSE	Designed to increase the density of cement slurry for controlling high pressure gas and oil zones.	Ground to a fineness that requires a minimum of mixing water. Because of its high specific gravity, it is possible to weight cement slurries to 20 lbs./gal., yet still maintain adequate pumpability and strength stability at high temperatures.

NEW ILMENITE!

A NEW HALLIBURTON ADDITIVE FOR IMPROVED WEIGHTING

Ilmenite is a special inert weighting material of high specific gravity for use in all types of cementing compositions, with very little effect on the physical properties of these slurries. Requiring virtually no water for wetting, Halliburton Ilmenite is a big improvement over other weighting materials because of its particle size (between 30 and 100 mesh).

CEMENTING SERVICES

"CREATIVE CHEMISTRY AT WORK"

NEW RELIANCE P-BASE MOTORS

Designed for outdoor and indoor installations

THESE RELIANCE FEATURES offer you the best motor for your pump installations.

Totally-Protected, weather tight construction—Corrosion-proof cast iron housing and sealed conduit box with threaded inlet locks out water, dust and foreign matter.

Perfect pump seating—True fit machined motor flange mates perfectly with pump flange, eliminating wear from misalignment.

Life long bearing protection—Special oversized thrust bearings designed for vertical operation are protected with Metermatic lubrication; you can't grease 'em wrong.

Shaft sealed—Neoprene shaft slinger protects windings from foreign matter creeping up the shaft.

Enclosures for every application—Protected, totally-enclosed, and explosion-proof, Cl. I Gr. D, Cl. II Grs. E, F, & G enclosures available, 1-30 hp. all electrical characteristics.

B-1680

Totally-Enclosed, Corrosion-Proof

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Explosion-Proof
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Write for bulletin B-2502 and check the facts on why Reliance Totally-Protected P-Base Motors are your best buy.

RELIANCE ELECTRIC AND ENGINEERING CO.

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THROUGH CONDUIT..

all the way with W-K-M *GATE VALVES*

Your well completion and production problems are materially reduced with W-K-M® Through-Conduit Gate Valves on your christmas trees. You get smooth non-turbulent fluid flow from tubing to gathering line with positive wellhead control.

Gates in W-K-M Valves have openings that are flush with the body passages with no place for sediments or paraffin to lodge or for corrosion to start.

The bore of W-K-M Through-Conduit Gate Valves has the same ID as the tubing it's used with so that it is possible to swab, caliper, run plugs, and perform many types of work-over operations right through the valve without disassembling the tree.

1. Parallel Expanding Gates for CONTROLLED FORCE SEATING
2. Teflon* inserts provide positive DOUBLE-TIGHT SEAL†
3. Two Thrust Roller Bearings
4. Enclosed Packing Gland
5. Pressure Seal Bonnet
6. Gates and Seats replaceable while valve is on tree

For full technical information concerning W-K-M Through-Conduit Gate Valves write for Catalog 200, address Dept. A-1021.

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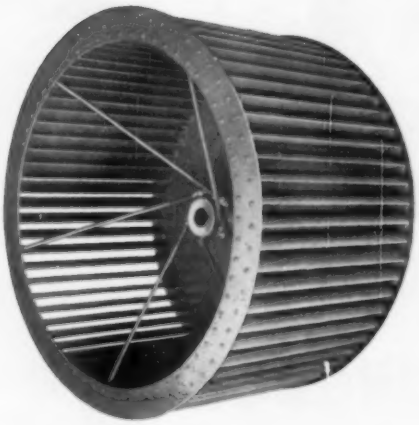
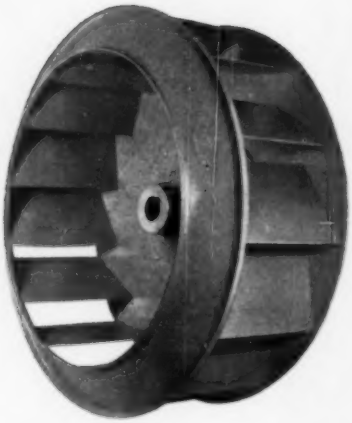
MANUFACTURERS OF W-K-M GATE VALVES · ACF LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

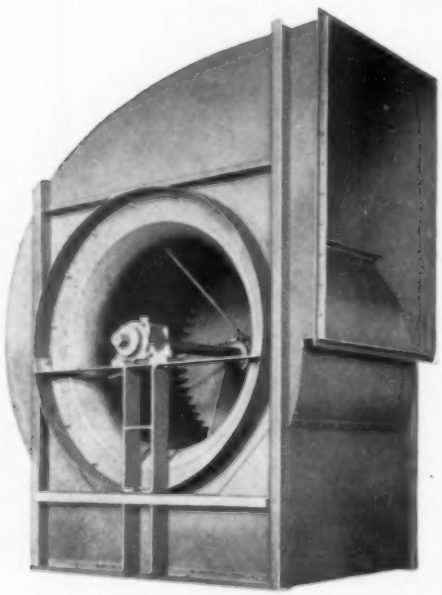


The Sirocco Wheel—Designed with a multiple number of narrow, curved blades, forward pitched. Operating at low rotative and peripheral speeds, it delivers more air per revolution than any other type of fan.



The HS Wheel—Medium-speed wheel with true non-overloading power characteristic; features large-area die-formed blades, mounted in backwardly inclined position between heavy-duty backplate and streamline rim.

Match the wheel to the job . . . with rugged, quiet American Blower Sirocco and HS Fans!



American Blower fans have Certified Ratings for dependable performance.

American Blower's complete line of fans lets you match the wheel to the duty, whether it's ventilating, air conditioning, heating; or drying, fume-removal, and processing systems. Their heavy-duty design and construction assure you of long fan life with a minimum of maintenance. Take the Sirocco and HS fans, for example:

Sirocco and HS fans offer smooth, quiet air delivery, high operating efficiency and dependable service. They are available in 25 standard sizes from 12¼" to 132" wheel diameters for volumes to over 700,000 CFM.

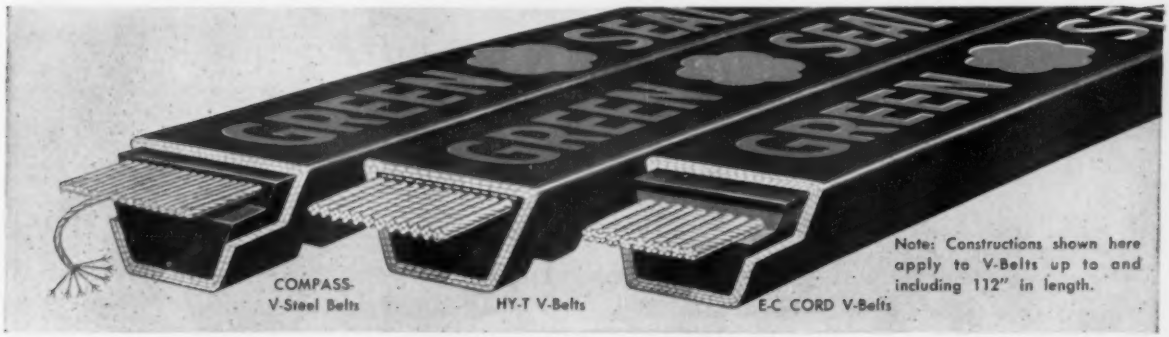
Precision-built Sirocco and HS fans can be specified in single or double inlet and in any of eight standard discharges, with ball, roller or sleeve bearings as required. Inlet vanes, dampers or Gýrol Fluid Drive can be furnished to meet volume control requirements. Larger sizes are designed so that they can be dismantled for easy handling in shipment, erection and maintenance.

Get details on the complete line of American Blower fans. Call our nearest branch office; or write direct to American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

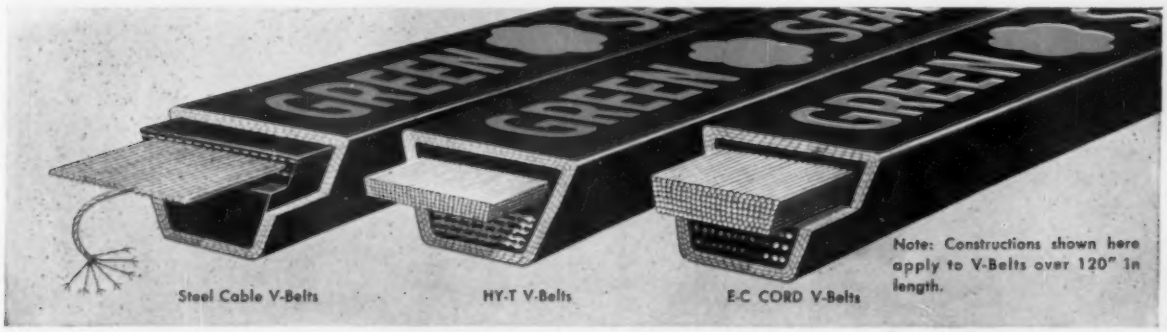
AMERICAN BLOWER

Division of **American-Standard**

What's different about



V-Belts with the Green Seal?



Plenty—when you're belting multiple drives. For that Green Seal certifies the dimensional stability of every belt that carries it. There's no surer guarantee that every belt in a set will match every other one—perfectly. And that they'll *stay* matched no matter how long you stock them before installation.

So the dimensional stability of Green Seal belts is solid protection against "loafing," slipping, stretching, scorching and other mismatching troubles. And most of the credit belongs to the belts' load carriers of airplane-type steel cables or Triple-Tempered (3-T) cord — Goodyear "exclusive" cord that's carefully tempered with Tension, Temperature and Time.

This unique 3-T process brings the synthetic cord to its point of greatest strength and stability. Result: the end of shrinkage in storage—plus greatest shock- and stretch-resistance in use. All of which assures you maximum, trouble-free horsepower hours at minimum cost. Why settle for less?

DIMENSIONALLY STABLE V-BELTS with the GREEN SEAL by

GOODYEAR

THE GREATEST NAME IN RUBBER

The Goodyear Tire & Rubber Company, Dept. 794, Akron 16, Ohio

Please send me complete information on what makes V-Belts with the Green Seal different from any others made today.

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Company_____

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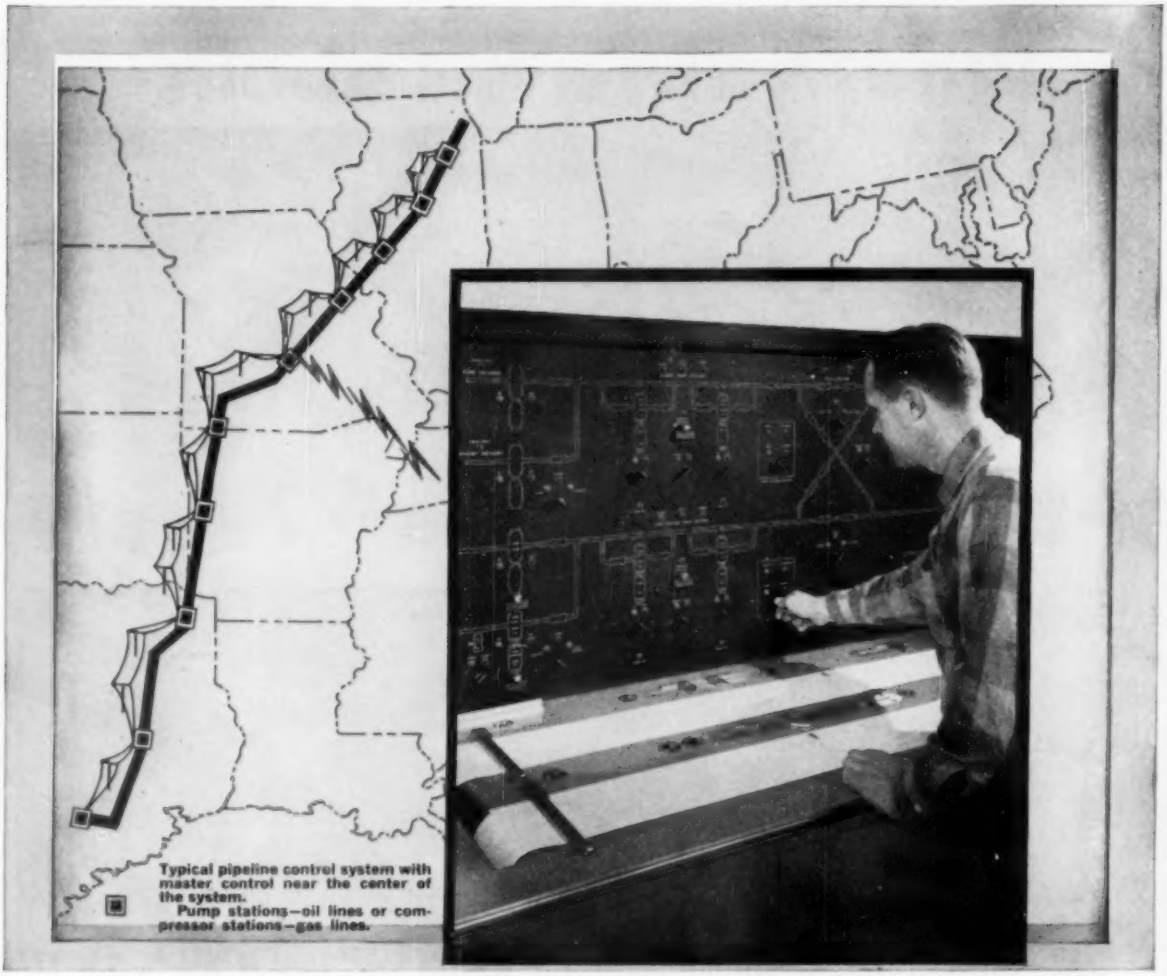
City_____ **Zone**_____ **State**_____

Compass, E-C Cord, Hy-T, Green Seal—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio


Typical pipeline control system with master control near the center of the system.
Pump stations—oil lines or compressor stations—gas lines.

UNION CTC means a complete Centralized Transport Control System

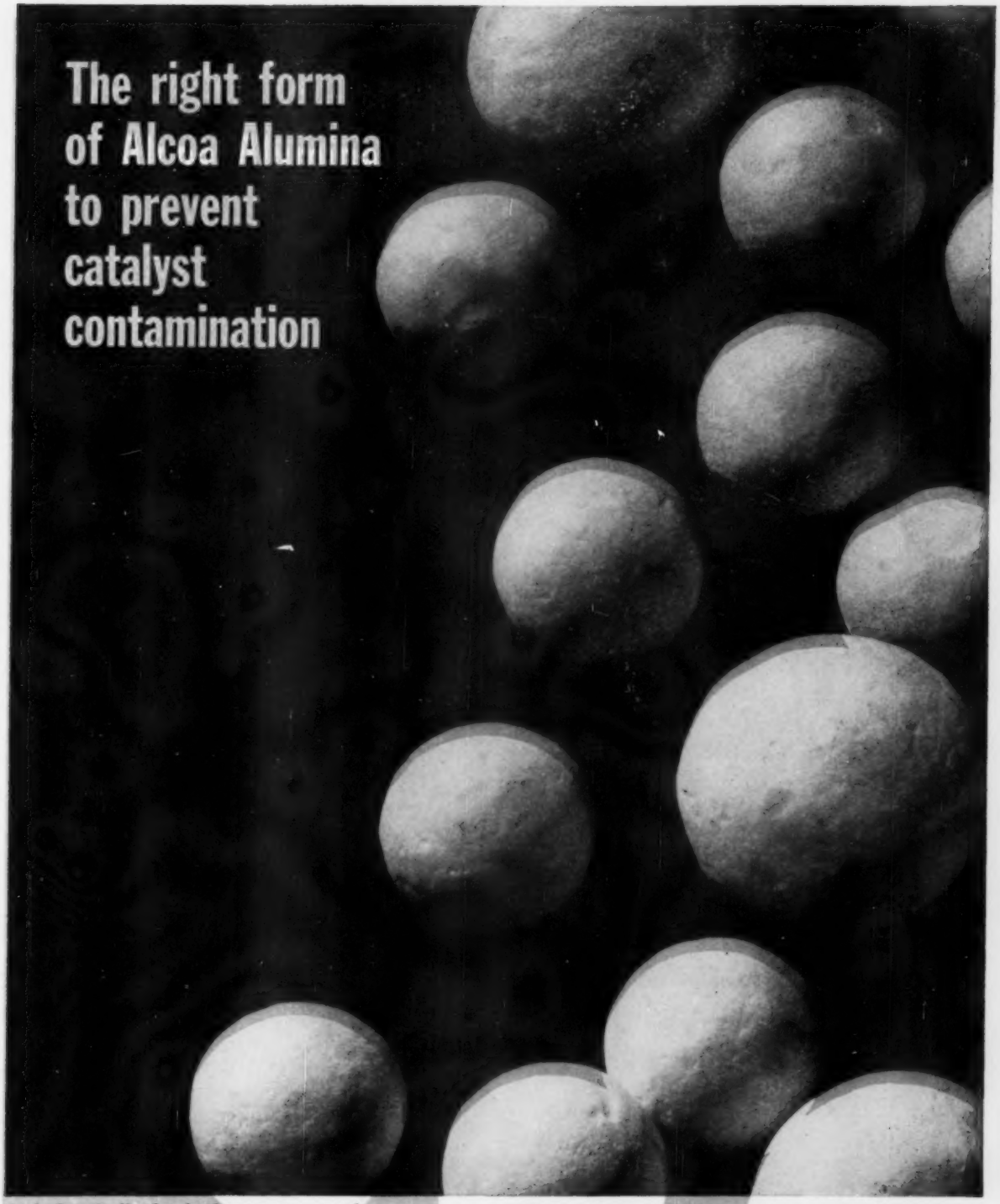
When you want a *complete* pipeline control system of any desired length, specify UNION CTC. Our engineering is based on the *systems design approach*, and Union Switch & Signal is prepared to take responsibility for integrating the entire control system. This includes communications, instrumentation, telemetering, and sequence control integrated into the one CTC system.

An operator located at a central dispatching office has all the information needed to control the flow of oil or gas throughout the system. He can function as if he were actually present at each station under his supervision. Control and indication codes can be transmitted over one pair of line wires or other channel in seconds.

UNION CTC provides more efficient dispatching and more effective control of through-put with considerable reduction in operating costs. It is *not* an expensive luxury . . . it is a profit earner.

If you are planning a new pipeline or modernizing an old one, Centralized Transport Control offers definite advantages. It can be used for gathering systems, tank farms and offshore applications. Write for our Bulletin No. 1052.

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

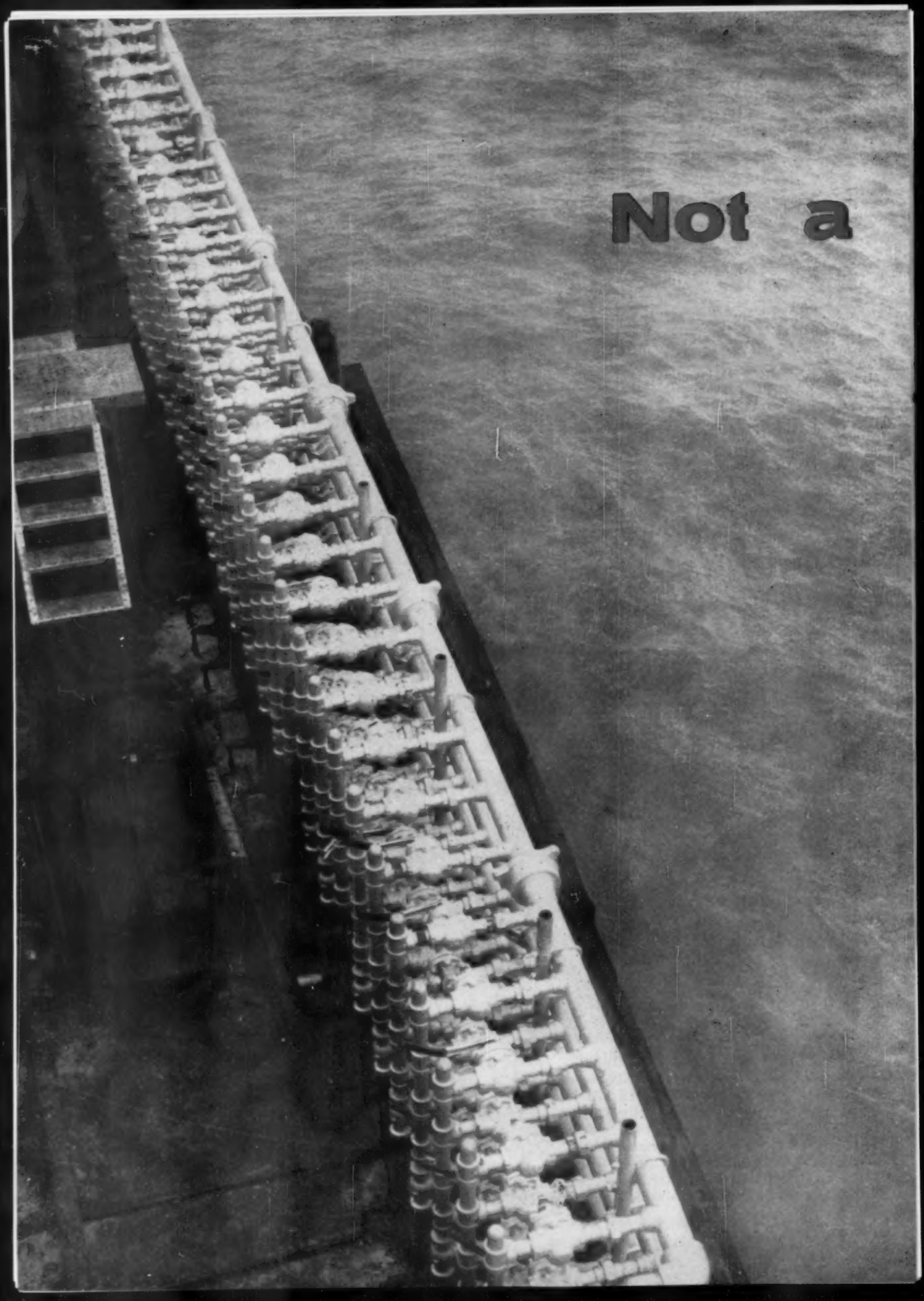


Tabular Balls for bed supports, packing and covers—Neutral, nonreactive, highly refractory and abrasion resistant, ALCOA® Tabular Alumina Balls will not contaminate catalysts or influence reactions. Of highest purity sintered alumina (+99.5% Al_2O_3), they are unaffected by oxidizing or reducing atmospheres below 3500°F... are practically insoluble in acid and alkaline solutions. They are available in sizes from ⅛" to ¾" diameter—and in grades to meet specific needs.

Don't let contamination raise *your* catalyst costs! Use ALCOA Tabular Alumina Balls for bed supports, covers and packing. For detailed information and samples, write ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 715-L Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA CHEMICALS

NEW!
"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings


Not a

"leaker" in the lot

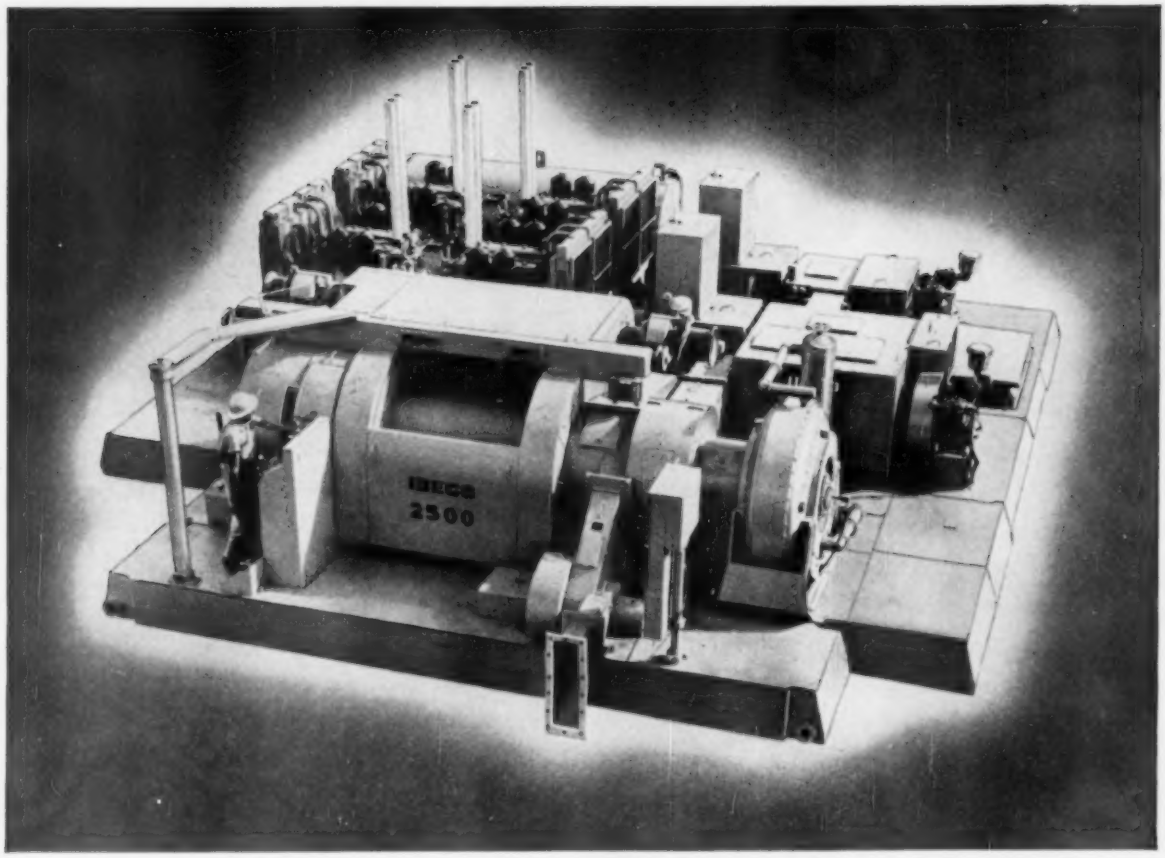
Even a single leaking valve can cause loss of product and costly repairs. With hundreds of valves at a single installation—like the off-shore tank battery manifold at the left—it's easy to understand why production people want the best valves available. That's why you see so many Rockwell-Nordstrom lubricated plug valves wherever oil or gas is produced.

Oil field men know that when they specify Rockwell-Nordstrom valves they are insuring positive shut-off and economical, trouble-free flow control.

Rockwell-Nordstrom valves cost no more to buy, often less, than ordinary valves—and they usually cost far less *per year of use.* A *complete* selection of sizes and pressure ratings is available at your local supplier. For complete details, see him or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off



In the drawworks... REX for two reasons

You'll find Rex Roller Chains in many of the Ideco Drawworks you see around the oilfields.

Why Rex? Ideco chooses Rex for the two very fundamental qualities a roller chain must possess to qualify in oil field service. Rex Roller Chain has these qualities.

The first is, of course, maximum life. This—a combination of resistance to wear and ability to withstand fatigue—is accomplished in an always continuing program of improvement in design and manufacture.

The second basic quality is ease of handling. Rex "glide-fit" manufacture permits fast coupling and uncoupling at any link. There are no rivet heads to burn off, no smashed fingers and frayed tempers, and—most important of all—the absolute minimum of down time.

In drilling service, Rex is enduring—convenient—and profitable. See your supply store. CHAIN Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT COMPANY

Milwaukee 1, Wisconsin

Oil Field Offices: Dallas • Houston • Los Angeles • New York
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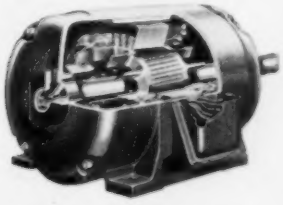
TWO WAYS...with Master Unibrakes

STOP-HOLD—Master Type M Magnetic Unibrake Motors. For quick, controlled stopping—especially when you want to hold the load. Spring-setting magnetic release brakes of the friction disc type combine with motor in a compact, integral unit. Sizes—⅛ to 150 H.P.

ROLLING STOP—Master Type D Dynamic Unibrake Motors. Braking is obtained with a unique, patented brake winding superimposed on the stator winding. Simple, compact, with no DC current required, the brake has no moving parts. There is nothing to wear or adjust—braking torque repeats consistently. Particularly recommended for automatic applications which do not require static holding. Sizes up to 30 H.P.



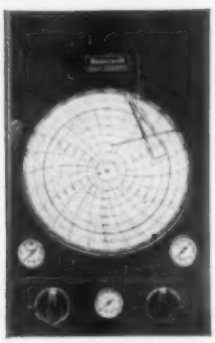
MASTER GEARMOTORS and variable speed drives can be supplied with integrated Unibrakes too. See Master for the perfect power drive for you.

Type M Unibrake

MASTER

THE MASTER ELECTRIC COMPANY
DAYTON 1, OHIO

UNIBRAKE MOTORS



Simplicity . . . Versatility, Too

A wide variety of models, ranges and accessories are available for exact matching of Brown thermometers and pressure gages to your specific applications.

Simplicity...

you'll find it in Brown thermometers and pressure gages

CLEAN, SIMPLE DESIGN—simplicity that minimizes operating or maintenance difficulties—sets Brown thermometers and pressure gages apart. Using direct, simple linkages, these rugged instruments have few elements. Basic components for both thermometers and pressure gages are interchangeable, and cases are identical. Maintenance is easy and your spare parts requirements are reduced. This is simplicity that will pay off in many years of reliable, economical service.

And with this simplicity comes dependable, high accuracy. The many narrow spans available, together with the large charts and scales, give you the full use of this accuracy.

Brown thermometers are particularly suitable for the intermediate temperature range, extending from —125 to 1000 F. Brown pressure gages are available in many ranges, with a minimum of absolute zero and a maximum of 4,000 psi.

Your nearby Honeywell sales engineer will gladly give you complete details on these instruments as they relate to your particular requirements. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

H HONEYWELL

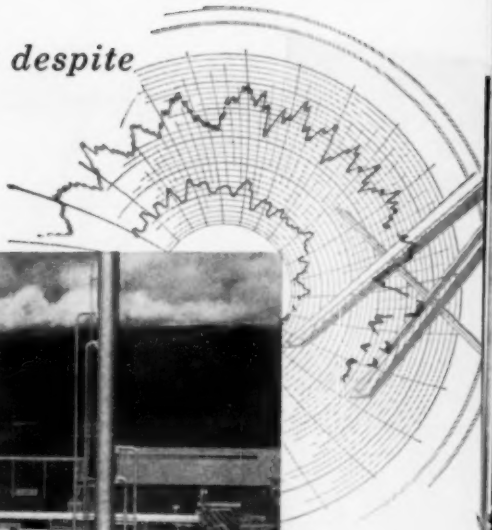
MINNEAPOLIS **Honeywell**

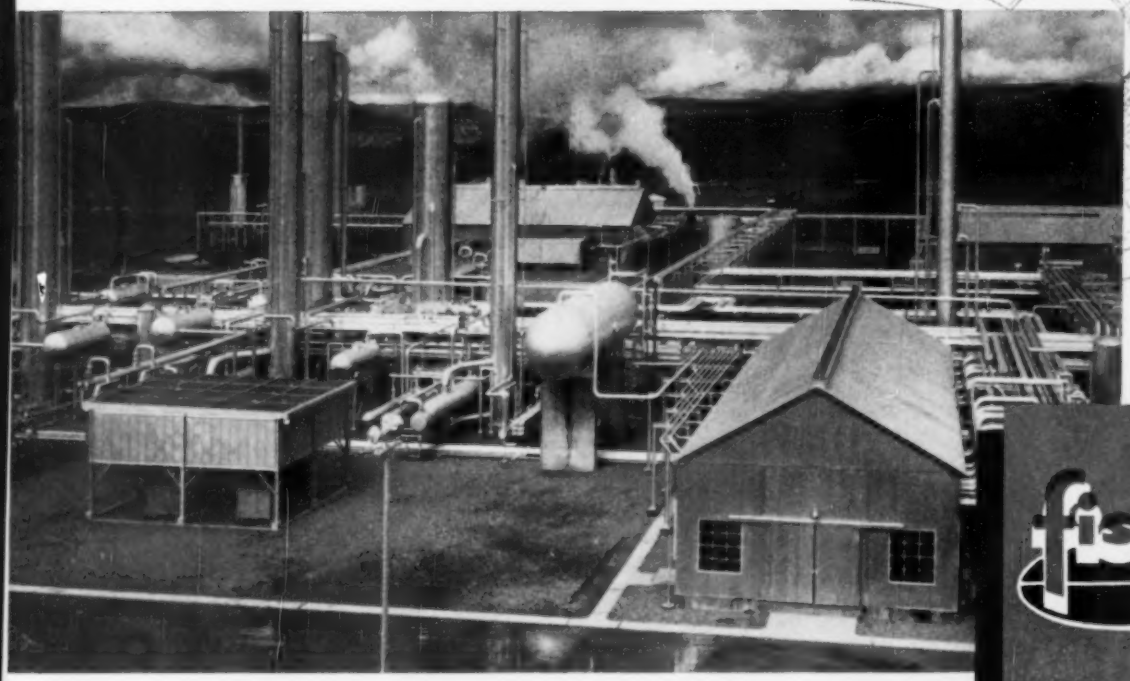
BROWN INSTRUMENTS

First in Controls

This gasoline plant operates efficiently despite

varying loads





The San Juan gasoline plant of the Pacific Northwest Pipeline Corporation is big! It was designed to handle 300 million cubic feet of gas per day and recover 340,000 gallons of liquids. But efficient operation over a wide range of loads was necessary.

Since it was placed on stream in October, 1956, the San Juan plant has operated efficiently and dependably at loads ranging from 20 per cent to nearly 100 per cent of capacity. This is an unusual record for a plant of this size.

Furthermore, because of a rigid timetable imposed by pipeline commitments, the plant was constructed in record time despite many unusual problems posed by terrain, weather and transportation.

Because of transportation limitations, the 90-inch by 56-foot absorbers had to be shipped to the site in sections. There, welding assembly was completed in the field. The units were then inspected and stress-relieved.

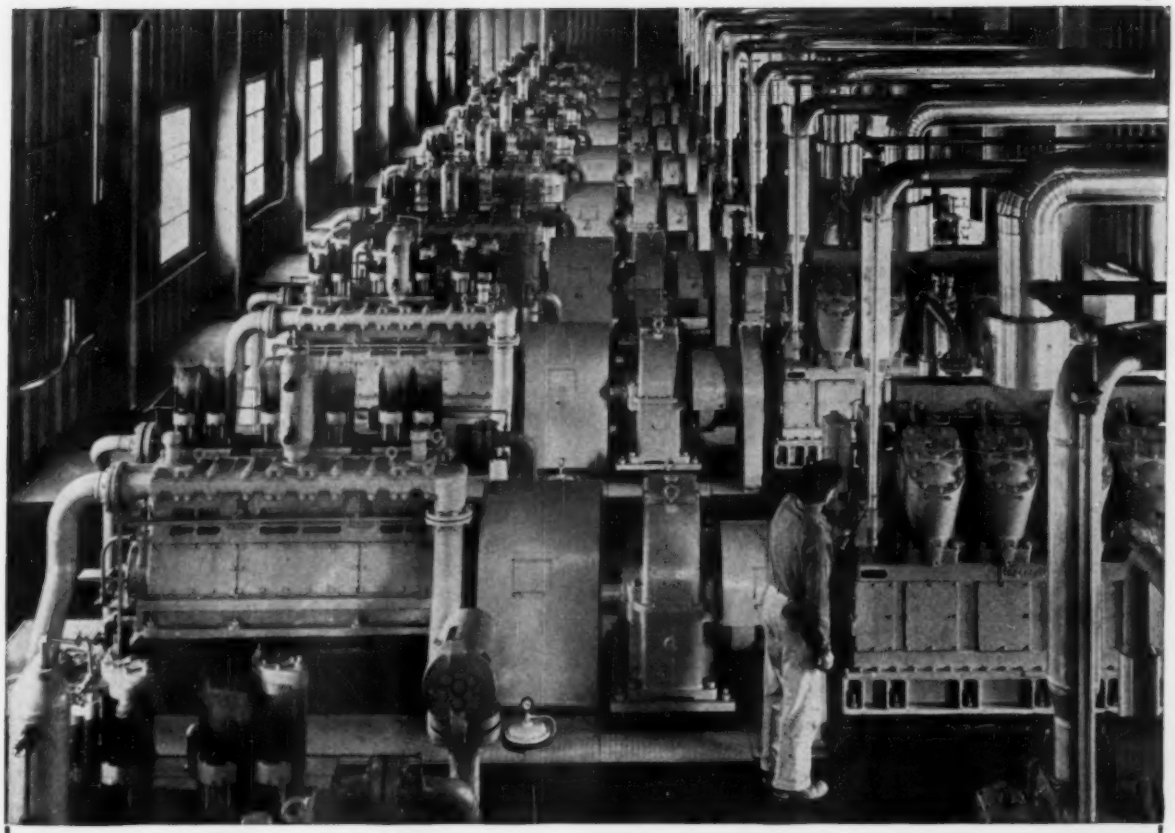
This is just one example of the way the Fish Companies tackle problems. Your problem may be entirely different.

If you are planning new facilities in oil, gas or chemicals, call on Fish for imaginative engineering . . . from feasability study to final completion.

the fish companies

HOUSTON

FISH ENGINEERING CORPORATION
FISH NORTHWEST CONSTRUCTORS, INC.
FISH SERVICE CORPORATION



FIELD REPORT

FLOOD: North Ward-Estes Unit

PUMPS: 10 Aldrich Septuplex

FLOODING STARTED: December 1954

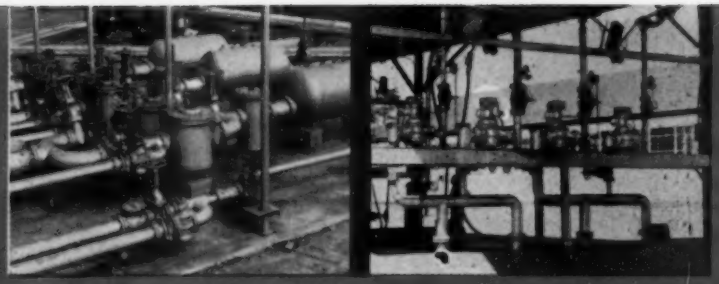
EXPERIENCE TO DATE:

Pumps operate constantly — 168 hours per week. There have been no breakdowns ... customer reports installation highly satisfactory ... "Maintenance actually has been less than we expected."

Field parts stock available in Carmi, Ill., Charleston, W. Va., Houston, Los Angeles, Odessa and Tulsa. For further information, write the Aldrich Pump Company, 3 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH

Typical installations of A. O. Smith Meters



Perfect Auditor

for any pipeline storage or transfer point

A. O. Smith positive displacement line meters account for every drop... *print* a permanent, tamper-proof record... simplify your bookkeeping

A. O. Smith developed the first rotary meter — proven over the years in accuracy and reliability. Now, we are expanding the scope of use of these meters by utilizing them as accounting machines. Let us tell you about it. Contact your nearest representative. Or write direct.

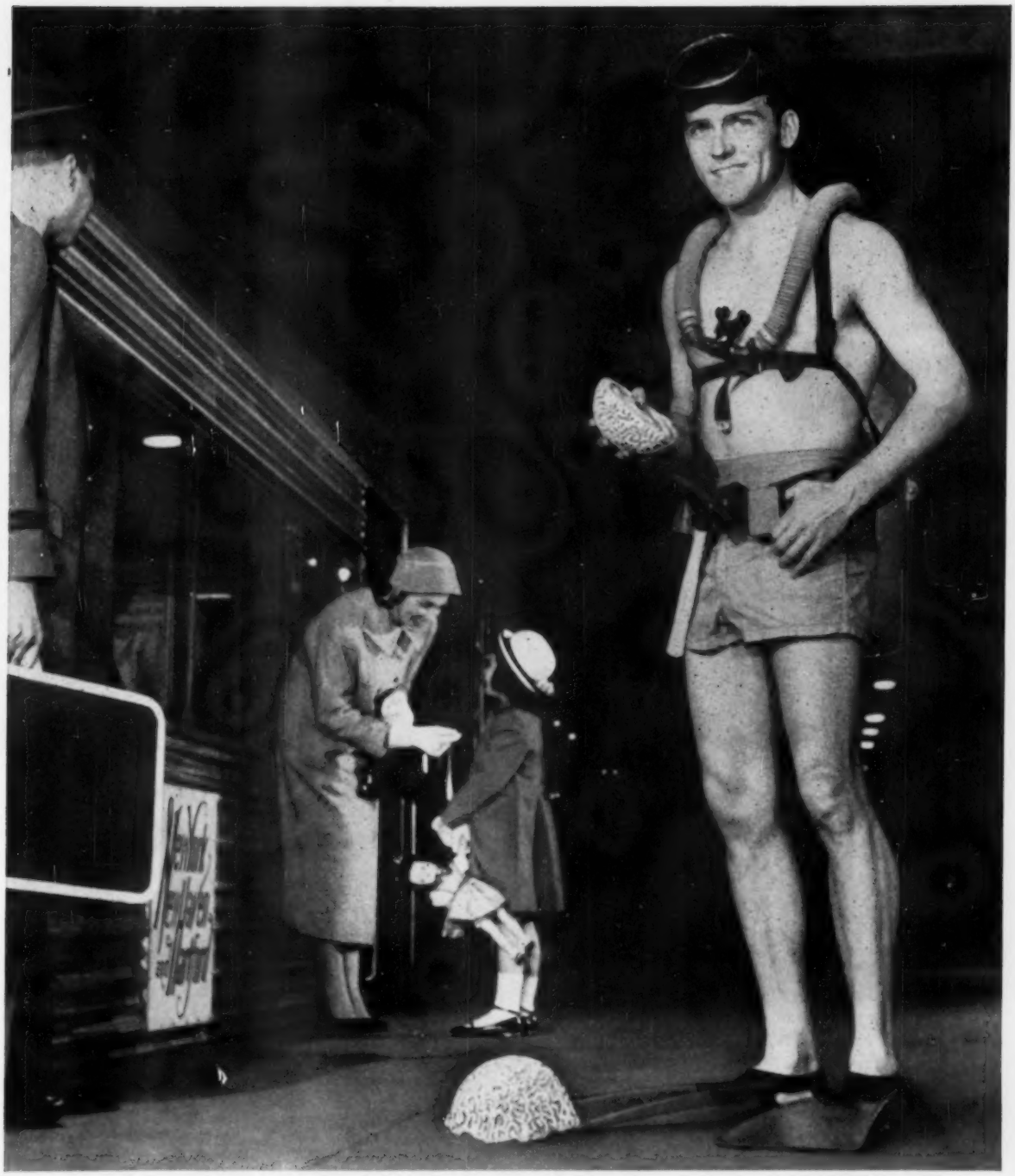
Through research ... a better way

A.O.Smith

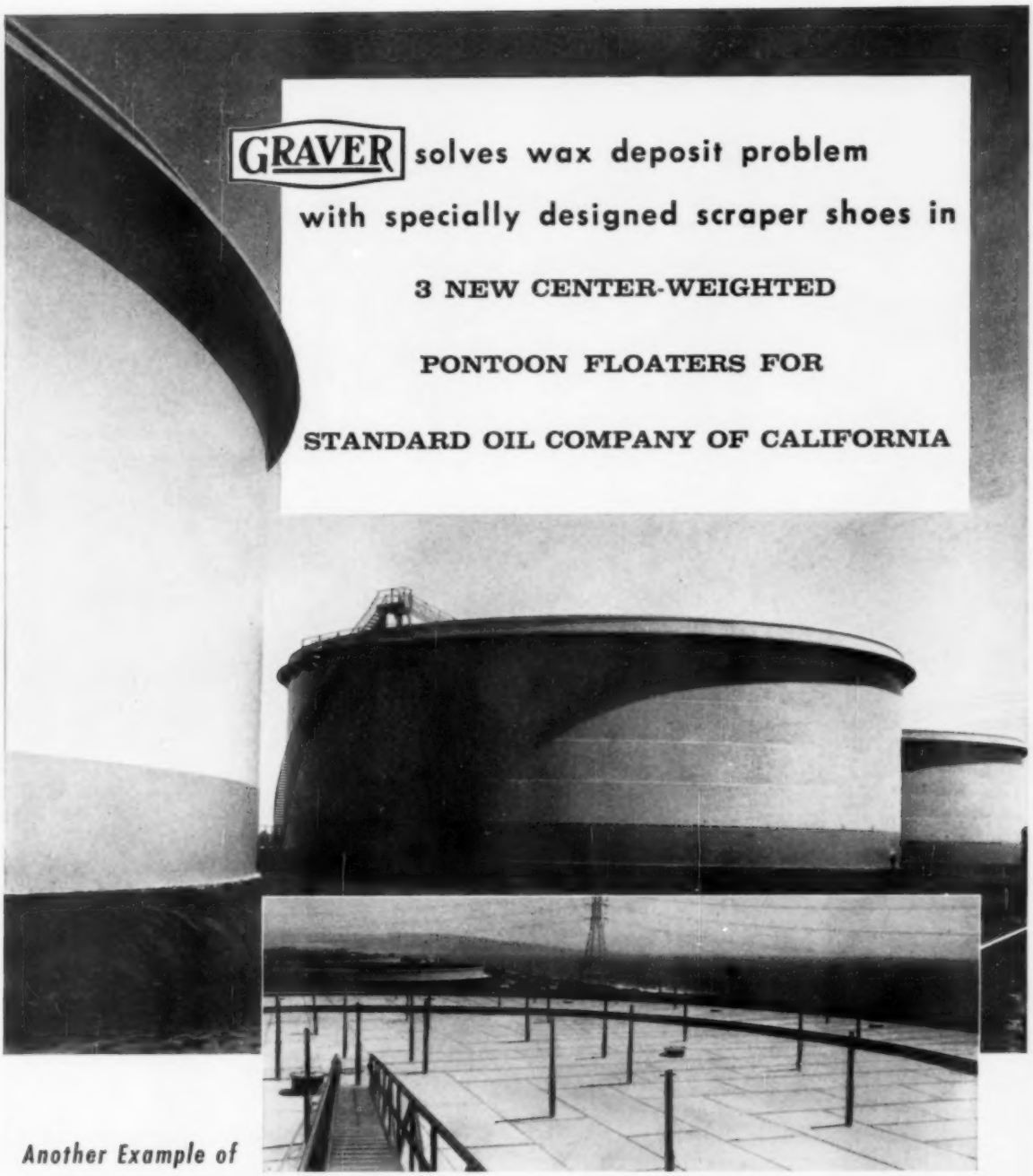
CORPORATION

METER, SERVICE STATION PUMP, DIVISIONS

Factories: 5715 Smithway St., Los Angeles 22, Calif., P. O. Box 500, Succasunna, N. J. Offices: Atlanta 5, Ga., Chicago 6, Ill., Houston, Texas, Los Angeles 22, Calif., New York 17, N. Y., Canada: Toronto 12, Vancouver 1. International Division — Milwaukee 1, Wisconsin



Make room for oilmen on the Limited. Our seagoing geologist doesn't usually travel with his coral samples. But they're clues in the search for oil, and he's making the point that oilmen help railroads carry people and freight from here to almost anywhere. The latest count tallied 440 million passengers and 2.5 billion tons of freight in one year. So if your seat mate on the train doesn't know the facts and talks against the oil industry, tell him you're an oilman and proud of it. And tell him why. **SHELL OIL COMPANY**


GRAVER solves wax deposit problem
with specially designed scraper shoes in
3 NEW CENTER-WEIGHTED
PONTOON FLOATERS FOR
STANDARD OIL COMPANY OF CALIFORNIA

Another Example of Graver's Design and Engineering Leadership

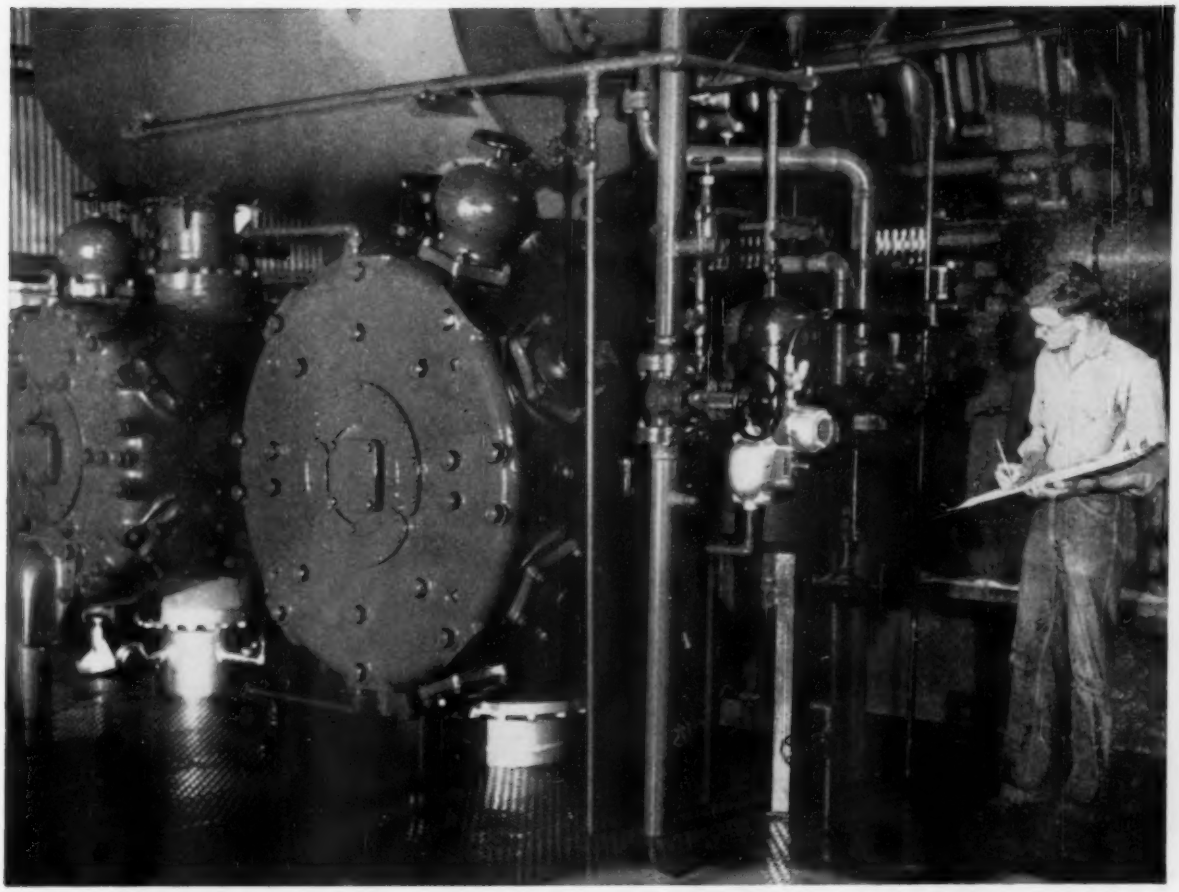
These three new Graver 160,000 bbl. floating roof tanks, with the center weight *under the deck*, were selected by Standard Oil Company of California as suitable for high wax content crude. This type crude may create a problem of wax build-up on the tank shell. Graver designed a special shoe of Type 304 stainless steel to provide a scraper action as the roof descends. This stainless shoe and the unique, lower-cost under-deck center-weighted roof design are examples of Graver's imaginative design and engineering leadership.

1857-1957 GRAVER Our 100th Year

Building for the Future on a Century of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • NEW YORK • PHILADELPHIA • EDGE MOOR, DELAWARE
PITTSBURGH • DETROIT • CHICAGO • TULSA • SAND SPRINGS, OKLAHOMA
HOUSTON • NEW ORLEANS • LOS ANGELES • SAN FRANCISCO • FONTANA, CALIFORNIA



Ease your mind about air compressor fires... with fire-resistant PYDRAUL® AC lubricant

Forget the anxiety of possible fires and explosions in your air compressors!

Successful field experience throughout industry proves that fire-resistant Pydraul AC protects against these hazards, gives excellent lubricity and can minimize carbon deposits on air compressor exhaust valves and air piping systems... where your fire danger really lurks.

From the largest reciprocating air compressor to the smallest portable... fire is a persistent worry, unless you use fire-resistant Pydraul AC to protect your investment.

Conversion is easy... essentially, just drain your flammable oil and replace with fire-resistant Pydraul AC.

Write today for Monsanto's new bulletin covering details on use of Pydraul AC.

There's also a Pydraul for every industrial job:

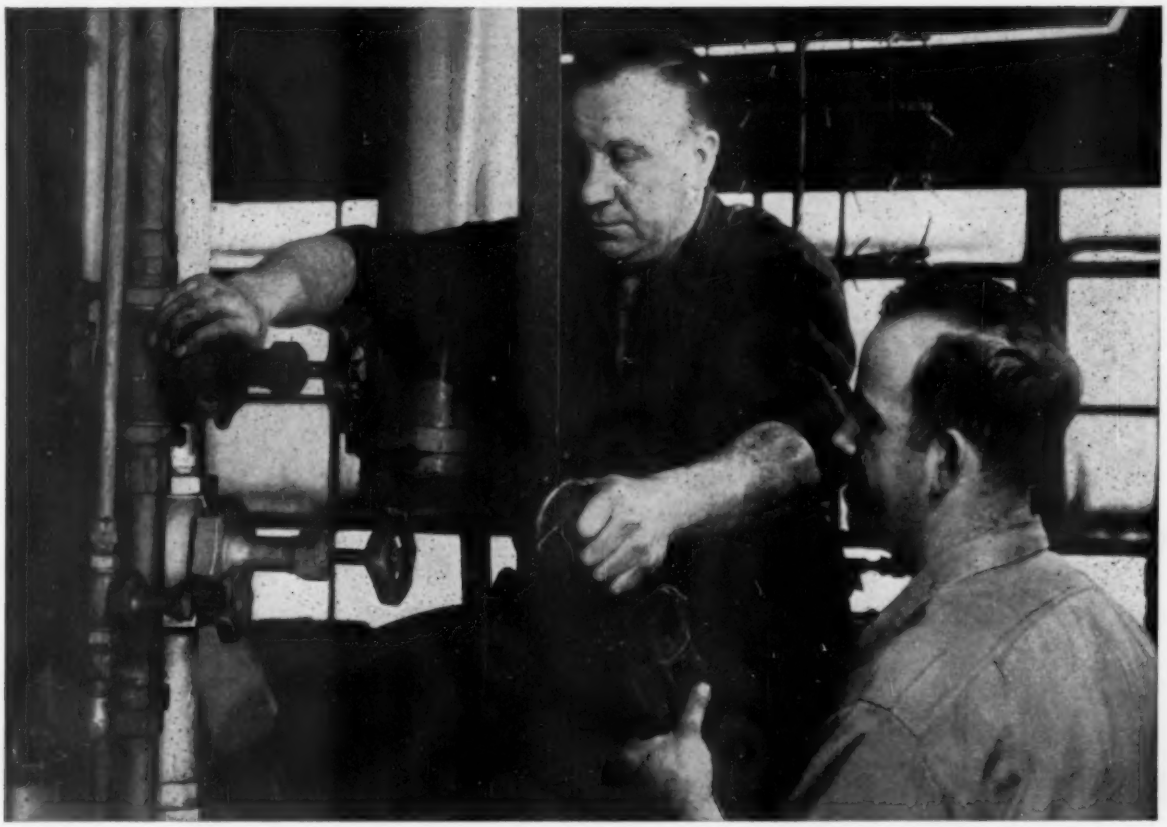
- General-purpose Pydraul F-9.
- Pydraul 150 and Pydraul 60 for precision equipment.
- Pydraul 600 for heavy equipment.

Pydraul: Reg. U. S. Pat. Off.

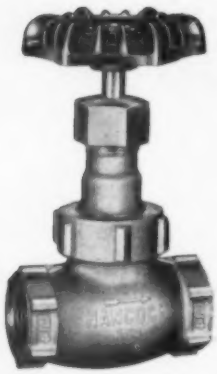
MONSANTO CHEMICAL COMPANY
Organic Chemicals Division, Dept. PAC-78, 800 N. 12th Blvd., St. Louis 1, Missouri
In Canada: Monsanto Canada Ltd., Montreal

MONSANTO

WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU



THIS "ACT" COSTS $10.00 AN HOUR . . . AND IT'S NO COMEDY!



Maintenance costs today make ordinary bronze valves an expensive gamble. Such valves with renewable composition seats and discs require frequent maintenance – piping systems out of service – unnecessary labor. And, the cost of a new disc is only the beginning!

You can eliminate both the expense and the problem. Use Hancock Bronze Valves with *superhard* "500 Brinell" stainless steel seats and discs. They last throughout the life of the valve – won't wire-draw, steam-cut or gall.

Be sure of highest efficiency and lowest maintenance. *Specify Hancock Bronze Valves!* Sizes range from ¼" through 2" in globe and angle types, with screwed ends – for all pressures up to 300 psi at 550° F.

PHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR for complete information about Hancock Bronze Valves. He is always ready to give you quick service.

When Hancocks go in, valve costs go down

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

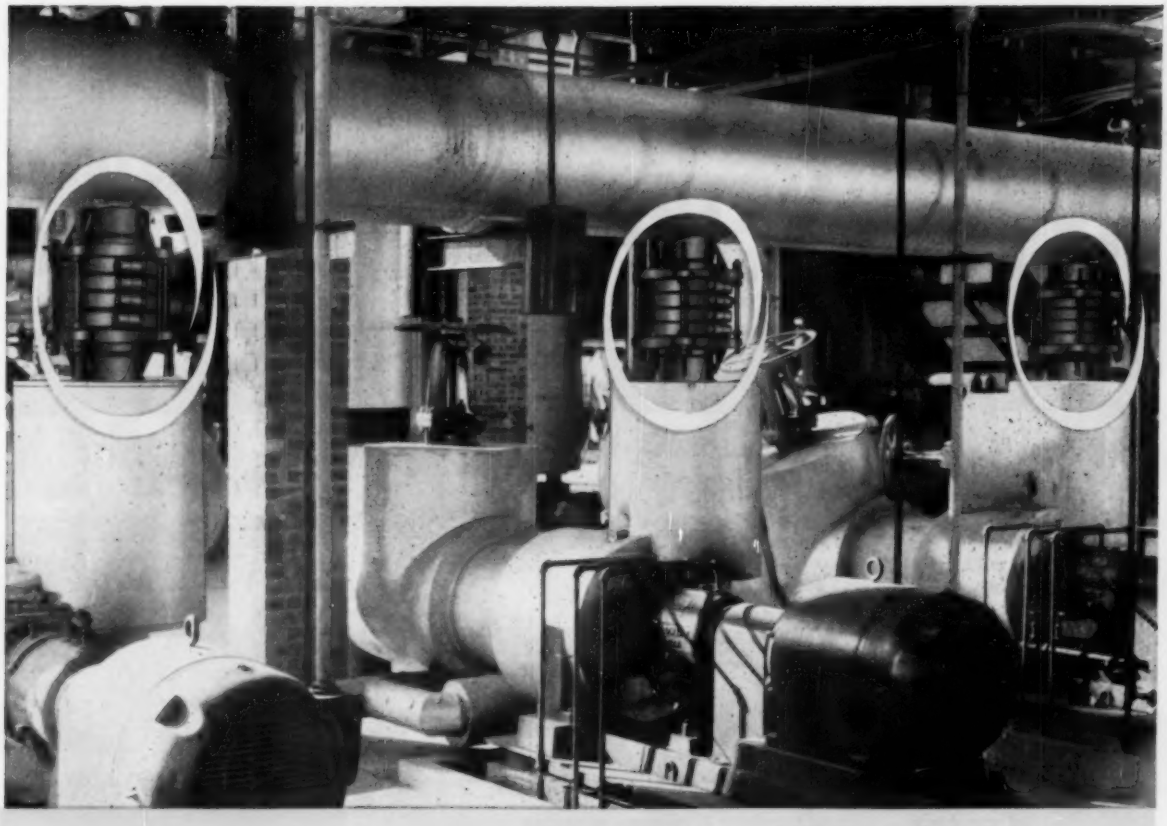
1877 HANCOCK U.S.A.

MANNING MAXWELL & MOORE TRADE MARK

HANCOCK VALVES

A product of **MANNING, MAXWELL & MOORE, INC.** Watertown 72, Massachusetts

MAKERS OF 'ASHCROFT' GAUGES, 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'CONSOLIDATED' SAFETY VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Okla.* AIRCRAFT CONTROL PRODUCTS, *Danbury, Conn. and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*



ADSCO CORRUFLEX EXPANSION JOINTS SOLVED A PIPING PROBLEM FOR NATIONAL ANILINE

The new $20,000,000 diisocyanates plant of the National Aniline Division, Allied Chemical & Dye Corp., at Moundsville, W.Va., is known for many engineering wonders, especially its miles of intricate piping. The photo above shows three ADSCO Corruflex anti-compression packless expansion joints used to secure satisfactory piping connections between the main piping and three pumps.

If rigid piping had been used to connect the three pumps to the 18-inch main feeder, the piping soon would have been twisted and overstressed by the growth of the main feeder when hot process liquid was pumped through it. National Aniline engineers, in consultation with ADSCO engineers, decided to use the anti-compression joints shown in the photo. These are deflected laterally with minimum strain on the connecting piping and pumps as the main feeder expands or contracts. Also, the joints absorb vibration of the pumps and motors.

For efficient, right-working pipe line arrangements, use ADSCO Corruflex expansion joints. Packless, they require no maintenance. Sizes, 3" to 54"; for temperatures to 1600 F and pressures to 300 psi.

REMEMBER! Use ADSCO Expansion Joints instead of Pipe Bends because of these advantages:

1. Less Heat Loss **2. Less Pressure Drop** **3. Less Space** **4. Less Cost**

ADSCO DIVISION
20 MILBURN STREET
BUFFALO 12, NEW YORK

YUBA
CONSOLIDATED INDUSTRIES, INC.

These valves will

NEVER NEED "LUBRICATION"

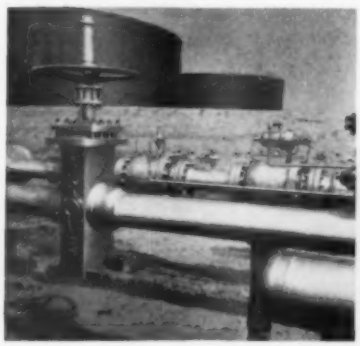
Grove Seal-O-Ring Gate Valves eliminate these costly maintenance and operating problems:

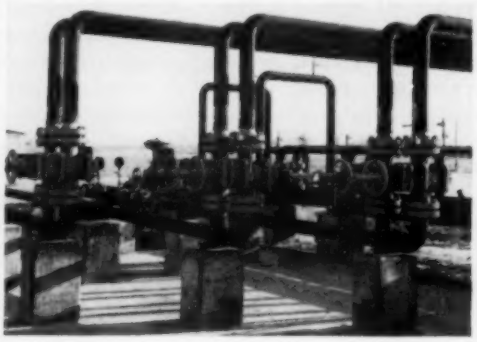
- No lubricants or sealing compounds needed
- No time or labor wasted in lubrication
- No sticking due to loss of lubricant
- No leaking from failure to lubricate
- No damaged gates or seats caused by improper lubrication
- No contamination of product or fouling of adjacent metering or control equipment

The squeegee action of the exclusive *Seal-O-Rings*, which are always in contact with the gate, wipes both sides immaculately clean. This maintains precision factory finish on the sliding surfaces, insuring full freedom of movement – without need for lubricants or sealing compounds. Bearings and stem seals are factory packed for a lifetime of normal service. For 2" to 36" lines – for oil, water, gas – specify *Seal-O-Ring*, the gate valve that's proved it can take care of itself year in and year out.

704

Write for colorful new Pipeline Valve Bulletin No. G-571





GROVE SEAL-O-RING Gate Valves

SUBSIDIARY OF WALWORTH

GROVE VALVE and REGULATOR COMPANY • 6529 Hollis St., Oakland 8, Calif.
HOUSTON 23—3517 Polk Ave. • • • • • LOS ANGELES 6—1930 W. Olympic Blvd.

GROVE SEAL RING ® GROVE SIMPLICITY ACCURACY SAFETY

ODESSA, TEXAS • TULSA, OKLAHOMA • CHICAGO, ILLINOIS • DENVER, COLORADO • In Western Canada: GROVE VALVE LIMITED, EDMONTON

Now... at 1/10 the cost... a better

ANTI-STALLING ADDITIVE

GULF AGENT 178

... proved by over 25 billion miles of stall-free driving!

GULF AGENT 178 provides economic, effective anti-stalling performance in motor gasolines. At the same time, it affords corrosion protection at no extra cost.

Look at what GULF AGENT 178 offers you:

PROVED PERFORMANCE—GULF AGENT 178—long recognized as an outstanding corrosion inhibitor for all types of petroleum products—is now used by major refiners in modern volatile motor gasolines to eliminate stalling caused by carburetor icing . . . and its effectiveness for this use has been proved in service by over 25 billion miles of stall-free driving.

LOW COST—Small concentrations—15 to 25 pounds per thousand barrels—give anti-stalling protection at as low as 1/10 the cost of commonly used de-icing additives.

EASE OF USE—GULF AGENT 178 is readily soluble in all petroleum products—can be easily blended at temperatures ranging from minus 30 to plus 140° F. Also, it is insoluble in water and can be handled in conventional gasoline transfer systems with no danger of loss from water leaching.

MINIMUM STORAGE—The small concentrations required eliminate need for expensive additive storage.

EXTRA BENEFITS—Rust protection it provides lengthens life of distribution and storage facilities from refinery to customer.

Let us demonstrate GULF AGENT 178 in your gasoline!

Petrochemicals Department
GULF OIL CORPORATION
Gulf Building
Pittsburgh 30, Pennsylvania

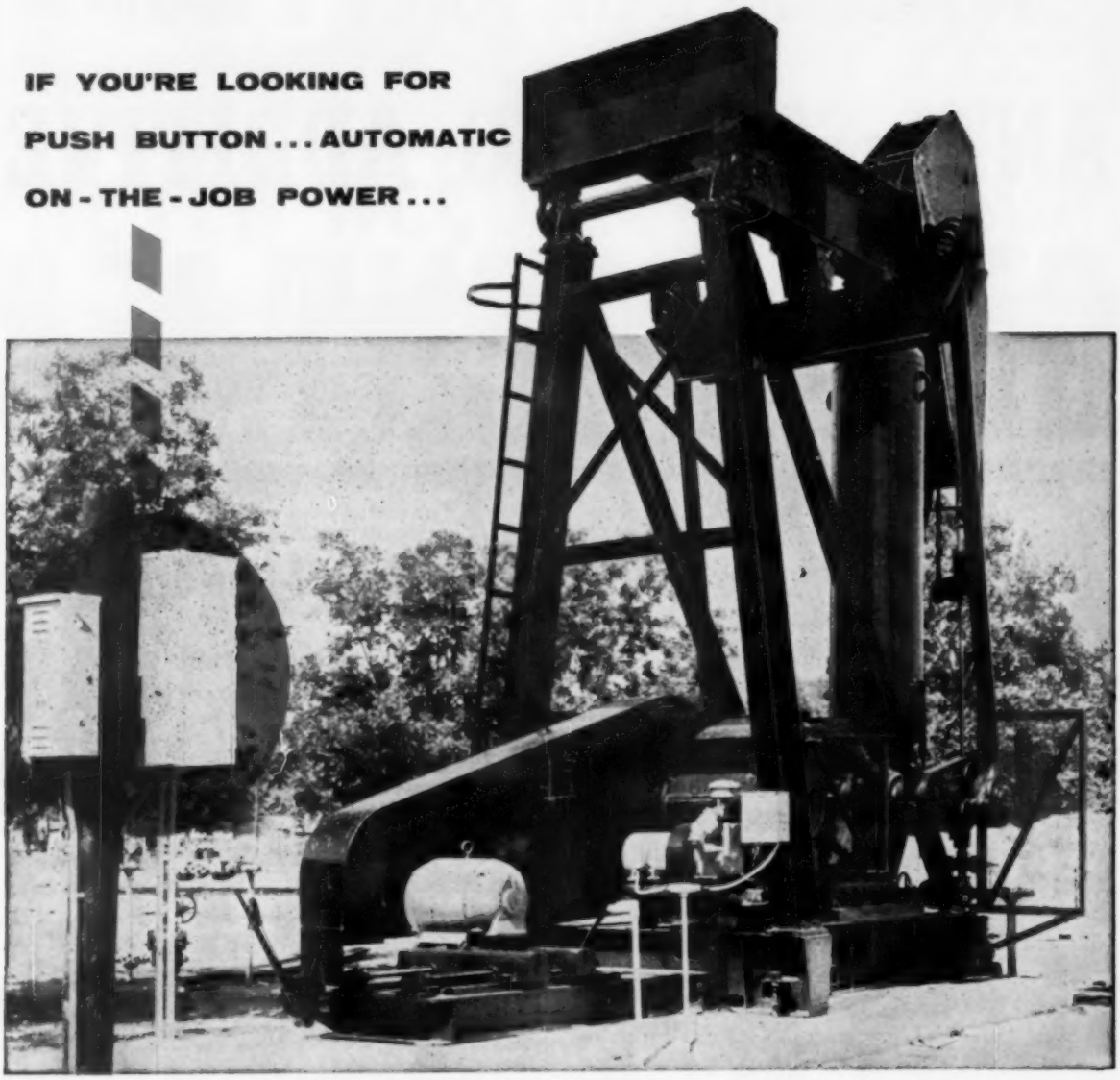
QUALITY CHEMICALS *from* PETROLEUM

GULF®

IF YOU'RE LOOKING FOR

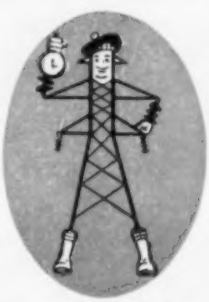
PUSH BUTTON... AUTOMATIC

ON-THE-JOB POWER...



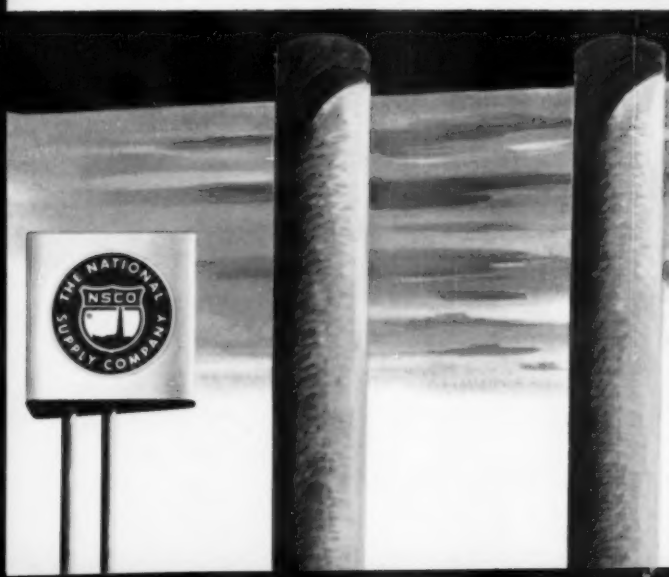
Be a bit shrewder . . . use ELECTRIC POWER

Automation is the key word in more efficient and progressive management today. And when you think of *automation* you must associate it immediately with UTILITY ELECTRIC POWER. Only UTILITY ELECTRIC POWER provides the complete, fully automatic features of automation in oil field production. The evidence is so impressive in favor of UTILITY ELECTRIC POWER that all companies – who consider themselves progressive – will want to know how they can benefit from this modern, efficient power. Call the sales engineer of your Utility Electric Service Company for complete facts.



I'm LCP – Low-Cost Power on the Job 24 Hours Daily

PETROLEUM ELECTRIC POWER ASSOCIATION



Today's best buys in the oil country

If you haven't discovered it—the local National Supply store offers you the best buys in equipment, operating and maintenance supplies you'll find anywhere.

Why are they "best buys"? To our customers it means every item they ask for—

(Continued on next page)

be it swages, fittings, pump parts, bearings, wire line—is of the best and highest quality obtainable.

And, because National store men make it their business to anticipate the needs of operators in their areas, stock items are available to fill those needs. If a special item, not normally stocked, is needed—it is ordered in the fastest way possible.

Tailoring equipment and supply inventory to your specific needs any day of the week is not an easy task. Hundreds of National field personnel and 128 stores work at the job around the clock. Moving your rig into a new territory? You'll find maintenance items quickly available at the nearest National Store. Thinking of a water-flood plant? Replacing pumpers? Need new wellhead assemblies? Equipment, supplies and operating information are as near as your local National store.

The best buy of all to many of our customers is the brand of service that comes with every purchase. Prompt handling, concern for performance and extraordinary assistance in emergencies is standard policy in National Supply store operations.

Add them all up—top quality products, in sizes and types that you specifically need, operating information, and extraordinary service. To most oilmen, this means "best buys." Why not visit your National Supply store soon and see for yourself?

Modern National Store interiors are designed to give you convenient "picture window" views of equipment, parts and accessories.

You can minimize the costly dangers of internal corrosion and paraffin accumulation by using Spang plastic coating—the only plastic coating in the industry applied at the mill. Order your next string of Spang Tubing plastic coated.

Rigid mill control standards insure SPANG® tubing quality

From the rolling of billets (see above) through each successive manufacturing step, Spang Tubing is completely quality-controlled by a series of accurate tests and inspections. The results are these outstanding features of two fine Spang Tubing products:

Spang Extreme Line Tubing

• Provides maximum running speed; fast joint make-up • Has 100% joint strength • Provides 100% resistance to leakage • Has 50% less connections • Provides positive shoulder contact engagement • Has a streamlined exterior • Is available in grades J-55, N-80 and P-105 to suit every well condition.

Spangseal Tubing

• Has 50% less connections • Provides 100% resistance to leakage • Provides more hole clearance • Eliminates "hanging-up" while running • Available in grades J-55, N-80, and P-105 for every well condition.

Gain the operating profit benefits of using tubing that will give you greatest performance. Order quality Spang Tubing from National Supply today.

SPANG-CHALFANT DIVISION

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; New York, N.Y.; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

On the next page, another quality Spang product...

SPANG® CW

Steel Pipe... there's no extra cost for its special quality

Careful manufacturing control is the reason why Spang CW is your best buy for every type of piping installation.

Rigid tests and inspections during manufacturing and before shipping insure long service life of Spang CW Pipe. Every length is hydrostatically tested and inspected for thread quality and uniformity.

Such quality control features pay off wherever you use Spang CW Pipe—and, most important, you pay no more for this top-product assurance.

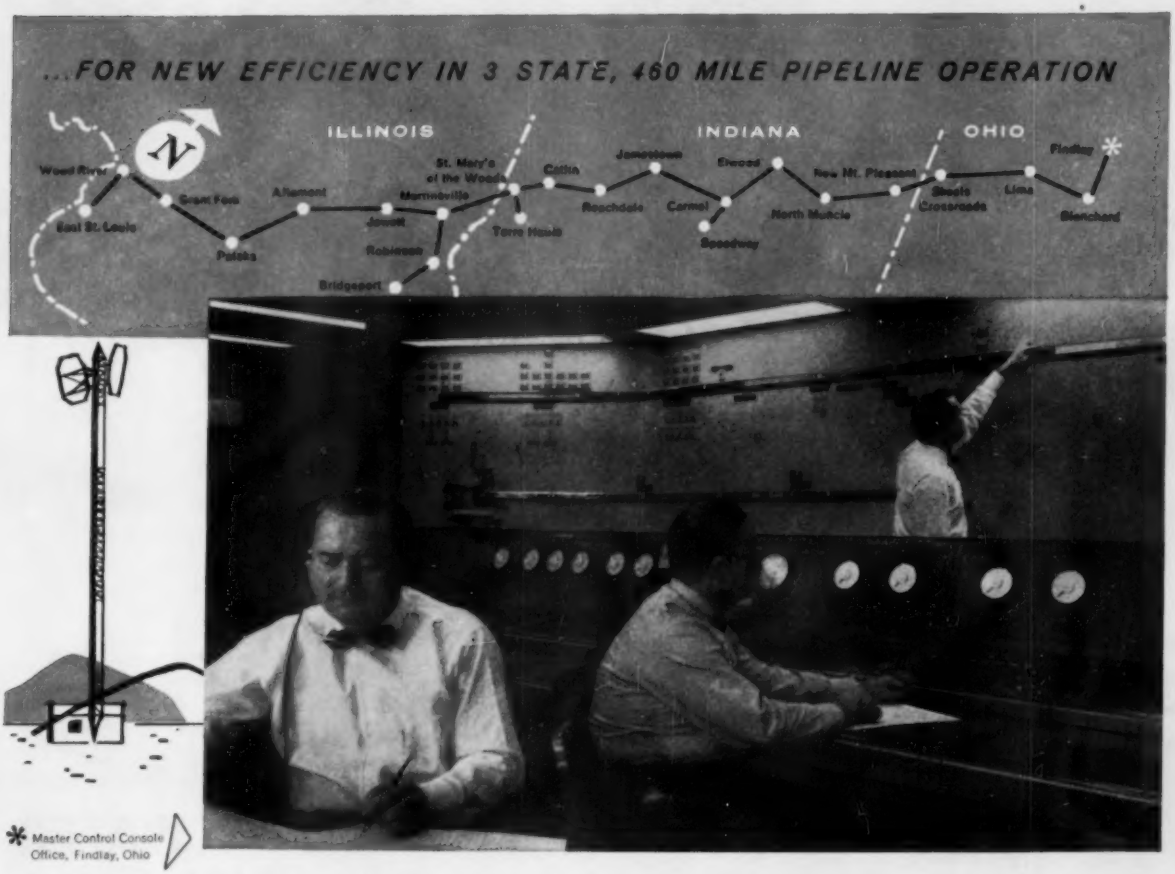
All sizes of Spang CW—plain end, or threaded and coupled—are readily available at your nearest National Store. Order now for your next job!

GATHERING LINE SERVICE is one of the many oil field applications for dependable Spang CW Pipe. In addition to gas, oil and water lines, you can use it for roof rails, step rails and other structural purposes.

SPANG-CHALFANT DIVISION

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Penna.
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; New York, N.Y.; Toledo, Ohio; Tulsa, Oklahoma; Calgary, Alberta, Canada
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

OHIO OIL replaces wire lines with **MOTOROLA MICROWAVE**



HERE'S HOW MOTOROLA MICROWAVE IS WORKING FOR OHIO OIL COMPANY . . .

Check the applications that could serve your operations.

- ☐ **VOICE CHANNELS**—24 duplex, 5 simplex party lines
- ☐ **REMOTE CONTROL** of two automatic pumping stations
- ☐ **TELETYPEWRITER**—3 circuits, 10 stations
- ☐ **SELECTIVE TELEMETERING**—Channels return 5 types of information
  1. Tank Gauging—Liquid Level
  2. Pressure—Suction and Discharge
  3. Specific Gravity—Pipeline Contents
  4. Pipeline Flow Meter Readings
  5. Temperature Readings—Pipeline Contents
- ☐ **VHF RADIO**—3 control points operate 8 base stations

Into this huge master console—the "nerve center" for Ohio Oil's "crude" and "product" pipe line operation—is fed control and supervisory data gathered throughout 23 stations along the microwave system. This data is transferred to a "batchboard" which provides an overall operational picture. From the console, the operator can monitor and control valves and pumps at crude oil pumping stations, eliminating the need for 24-hour attendance at these points.

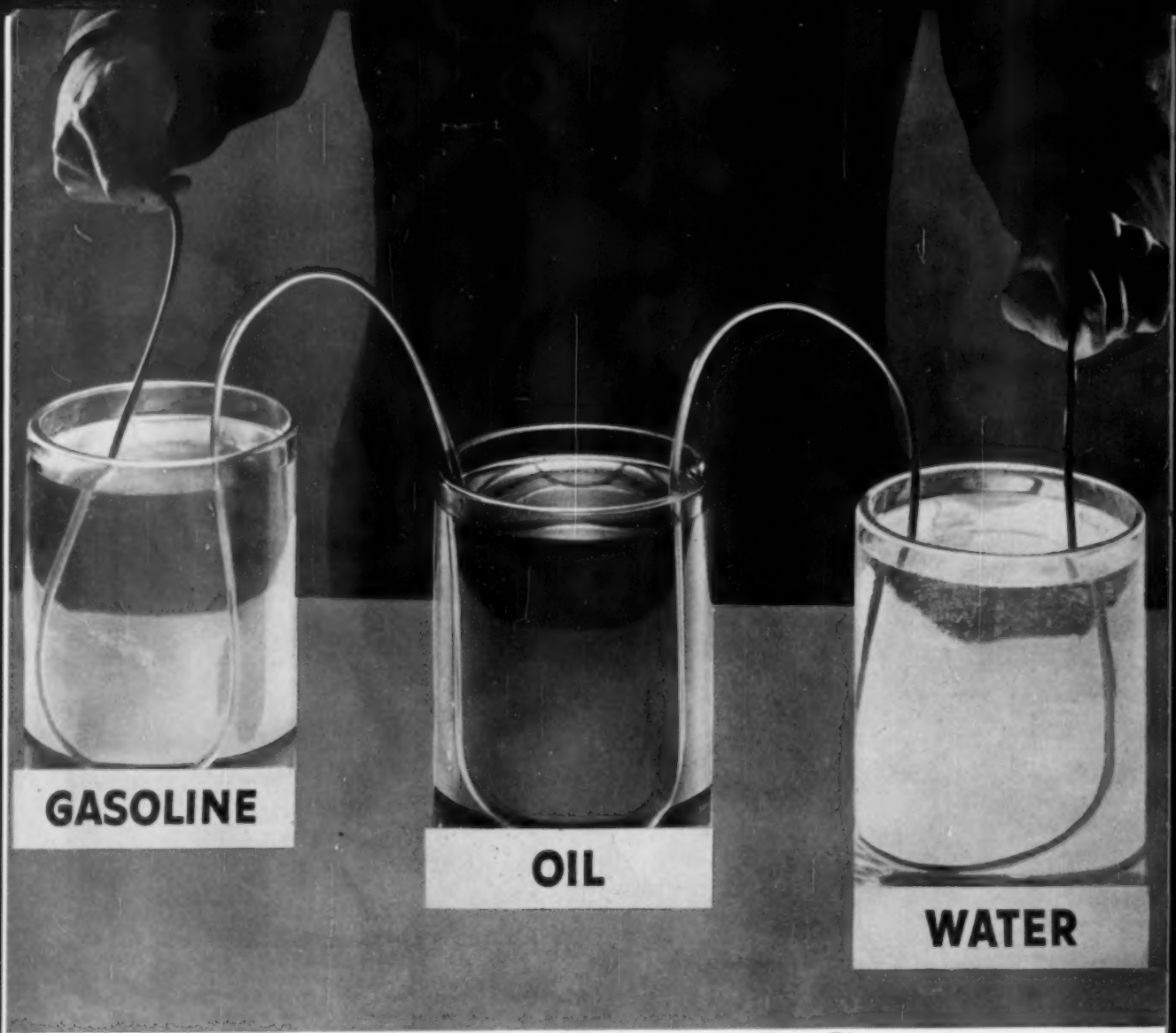
Along the entire system, telephone, teletypewriter, telemeter and remote control circuits provide dependable communications, free of weather damage or interference. VHF radio base stations, at several microwave repeater stations, supply system-wide coverage to and from vehicles equipped with Motorola 2-way radio.

"It takes efficient, reliable communications facilities to keep oil moving along our 'Big Inch' pipe line 24 hours a day," says Mr. Ralph M. Slough, manager of pipe line communications, Ohio Oil Co., "and Motorola Microwave gives us a better and more efficient operation than we obtained with our previous wire line arrangement."

For a hundred miles or a thousand, Motorola Microwave provides dependable communications at lower overall costs—let us prove that Motorola Microwave can do a better job for you, too!

MOTOROLA MICROWAVE

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC. • A SUBSIDIARY OF MOTOROLA, INC. • 1400 N. CICERO, CHICAGO 51, ILL.



DENTROL WIRE—submerged in gasoline, oil, water—proves resistant to all 3.

New Dentrol thermoplastic wire RESISTS ALL 3—GASOLINE, OIL, WATER!

Dentrol wire affords *new safety* wherever wiring is exposed to gasoline or oil—*new economy* over the lead-covered cable you're now using in these areas.

Made with a clear nylon jacket over-all, Dentrol not only beats gasoline, oil and moisture—but is exceptionally resistant to abrasion. It is easily installed (hard, smooth finish makes pulling through conduit simple), easily stripped, lightweight for easy handling.

Suggested uses: for 600 volt wiring for lighting, power and control in and around service stations, refineries, tank farms, and industrial plants.

Dentrol is Underwriters' Laboratories approved as TW and "gasoline-resistant" wire for use in open raceways where exposed to gasoline or gasoline vapors. Thus it meets the provisions of section 5023 of the 1956 National Electrical Code, concerned with installations in hazardous locations.

Available in colors, and in 500′ cartons. See your Anaconda distributor. For information write: Anaconda Wire & Cable Company, 25 Broadway, N. Y. 4, N. Y.

57394 Rev.

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM **ANACONDA®**
FOR **DENTROL WIRE**

They Say—

12 years with one car

Dear Sir:

While I hesitate to place myself in the category of a "young engineer with well lubricated slide-rule," I may say that I read the Journal religiously each week, cover to cover, and noticed the request for information on automobile replacement (OGJ, Journally Speaking, Sept. 23, p. 59).

This subject is adequately covered in an article by F. C. Helen, Allied Chemical & Dye Corp., "Replacement Problems," appearing in "Chemical Engineering," August 1955, p. 181. His conclusion is that 12 years is the most economical time to trade automobiles. Needless to say, it will take a courageous editor to put that one in print.

Robert R. Park
Engineer
Texas Eastern Transmission Corp.
Shreveport, La.

(Editor's note: Printing the 12-year conclusion takes small courage. The real badge of courage is trying to convince your family to live with the same auto 12 years.)

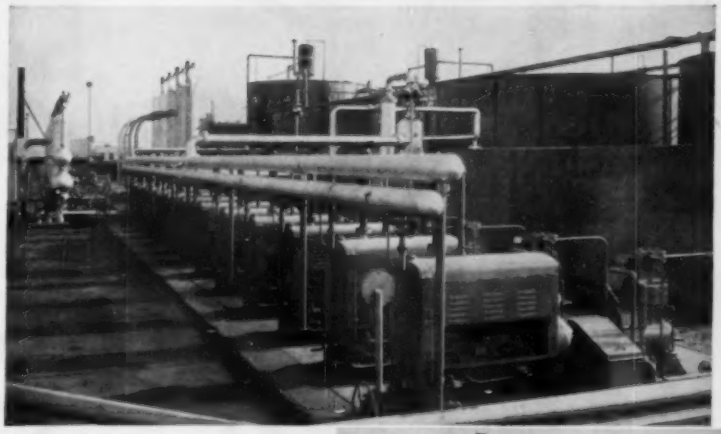
Led astray by cock-eyed map

Dear Sir:

It is a source of relief to me to find that even such a meticulously edited magazine as The Oil and Gas Journal can pull a boner. Actually I have always felt that I was one of that small minority who did that sort of thing, and then out of sheer embarrassment, paid for the libations. But now I shall not feel too badly because I know that I have traveled with very distinguished company.

I was requested by a law firm to make a check of certain lands located in 6n-32w1 southeastern Saskatchewan, in an estate matter. I had just finished an article about that section and remembered that a map was carried on page 182 of the August 19, 1957 issue covering this particular area. The map of the area . . . showed production. Never thinking about checking against some other maps, I wired S. Brodylo of Petroleum Digest, Ltd., at Calgary for such information as needed for evaluation purposes. Also wired Bob Svare of Well Information Services, Calgary, for well completion and production data. I gave it no more thought until receiving a wire (collect) from S. Brodylo that there was no information

WEST COAST OIL CO. PURCHASES SECOND VAPOR PHASE® SYSTEM



Efficiency and Economy of Operation So Successful Eight More Engines to be Vapor Phased

So pleased with the performance of its first Vapor Phase system, installed in 1951, this well-known oil company is now installing a second system to service eight additional engines.

Shown above is the original installation of twelve 45 bhp Minneapolis-Moline engines, all operating on the single Vapor Phase separator seen in the center.

This single unit utilizes the steam output of all twelve engines for power oil heating.

Want more information on how Vapor Phasing can improve the performance, and cut the operating costs of your installation?

Write or call for recommendations and estimates. No obligation.

"Sole Developers and Manufacturers of Vapor Phase Thermal Circulation (Ebullition) Engine Cooling."

EC VAPOR PHASE

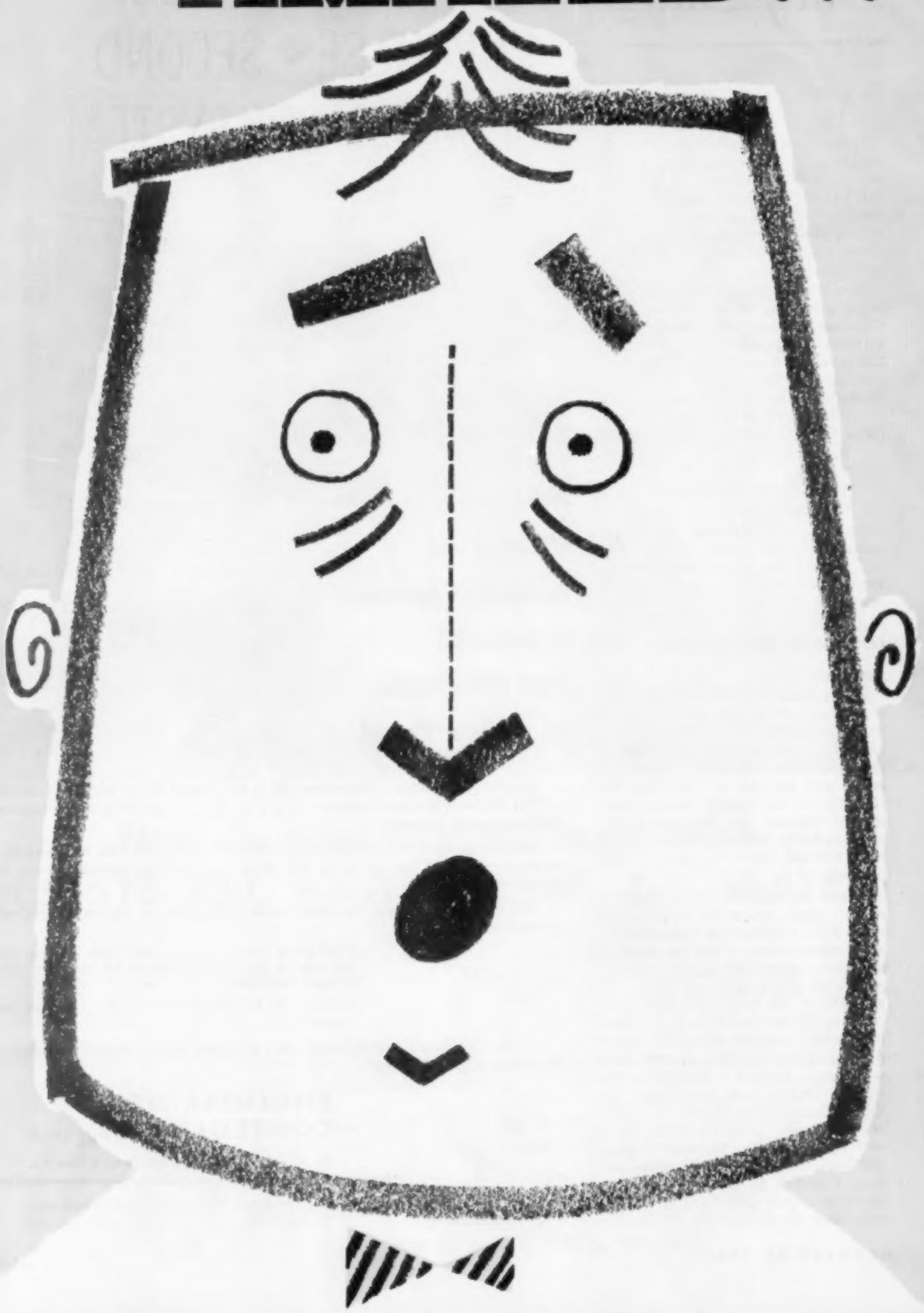
ENGINEERING CONTROLS Incorporated

An Affiliate of St. Louis Shipbuilding & Steel Co.

328 Paul Brown Bldg.
St. Louis 1, Mo.

1939 N. Hillhurst Ave.
Los Angeles 27, Calif.

AMAZED . . .



SURPRISED and PLEASED

with the new

oilmaster

INSERT PUMP ANCHOR

AMAZED with the simplicity of its operation. Run the Insert Pump equipped with an Oilmaster Anchor to any desired setting point in the tubing string—pick up rods to actuate the release mechanism—set down to pack off—start pumping. Since no rotation is required, there is no need for special anti-swiveling clutches on the pump and no need to perform the hazardous operation of rotating the rods to set the anchor.

SURPRISED at the positive action of the new compression type rubber. When the slips are set, internal wickers on the inside of the split cone grip the body of the anchor and hold the rubber compressed in a set position. This arrangement provides adequate hold-down force to keep the pump seated while the well pumps up, and to prevent the pump from unseating in a well that periodically heads and flows.

PLEASED with the money saved when beaming a well without pulling the tubing.

Ask your Oilmaster Representative for a demonstration and we confidently predict you too will be *amazed* with the simplicity, *surprised* at the versatility, and *pleased* with the savings to be had through the use of the Oilmaster Insert Pump Anchor.

The unique split cone design is internally wickered to provide a positive initial hold-down with a reliable compression packoff rubber.

oilmaster PUMPS — FOREMOST IN THE INDUSTRY

FLUID PACKED PUMP CO.

Main Office and Plant, Los Nietos, California

Distributed by the National Supply Co., Pittsburgh, Pa.

Export: The National Supply Co., Export Division, 600 Fifth Avenue, New York

Co-Distributors: Union Supply Company, Beacon Supply Co., Industrial Supply Co.

WHAT
IS
IMPORTANT
IN A
PISTON ROD?
DIAMOND HARD PRODUCTS
DIAMOND HARD PRODUCTS
DIAMOND HARD PRODUCTS
DIAMOND HARD PRODUCTS
Longer service life, greater resistance to rod breakage — these are Harrisburg features that reduce drilling costs. Harrisburg Diamond Hard Piston Rods and Super Hard Chrome Piston Rods are made from fine-grain, high-strength alloy steel, scientifically heat treated for both case hardness and core toughness. Precision-ground API taper assures exceptionally tight rod and piston fit, yet permits easy removal of piston without rod breakage. Precision-ground threads with stress-relief radius prevents rod breakage at the taper. Write for complete catalog and prices.
Harrisburg Diamond-Hard fluid-end products are precision-matched for superior performance under the most extreme high-pressure, deep drilling conditions.
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Sales & Service, Inc.
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CABLE ADDRESS-HSSINC, Houston, Texas

available, so far as wells and production were concerned, in the area where I had requested full data.

So now I drag out a map put out by the Department of Mineral Resources, Province of Saskatchewan, and discovered that the map on page 182 is cock-eyed when it comes to ranges. Range 30 should be 31 and 33 should be 34. So, I feel so much better knowing that once in a while even the best of us—GOOF.

Harry G. Letts
Independent
Great Falls, Mont.

Boy Scouts get send-off

Dear Sir:

On behalf of our committee and its objectives I want to thank you most sincerely for the fine send-off you have given the science of geology, the October theme of the month in the program of the Boy Scouts of America, in your issue of The Oil and Gas Journal, September 30, 1957, p. 141.

Our little committee—composed of some grand men whom nobody could hire for love or money—at one time thought our job was completed when, after working at the job for 9 long years, we were successful in getting geology adopted into the regular merit-badge program of the Boy Scouts of America. But how mistaken we were. . . . We quickly learned that we had a distinct challenge in telling youth there was such a science as geology and what it was all about.

So thank you again for your fine article on "The Greatest Show on Earth."

Frank Gouin
Duncan, Okla.
Chairman
Boy Scout Committee
American Association of
Petroleum Geologists.

Depletion provision abroad

"Much has been said about how percentage depletion is important and necessary for the financing of discovery of new oil reserves. That, in our opinion, is a secondary factor. Our position is that percentage depletion is as valid on foreign production as on domestic, and for the same reason.

"The primary purpose of establishing and continuing percentage depletion is that the production of oil from its reservoir is an act that exhausts a capital asset. The depletion allowance provides for a return to the producer of a portion of his wasting capital, without string, and for whatever use he may see fit. It is based upon the same considerations that authorizes the

Now Standard refines a rare "rock" to give U.S. a new source of gasoline

High pressure water jet shatters solid Gilsonite. Flume hose washes particles down mine floor to pipeline.

Petroleum products are now being made without crude oil. Standard found the answer in a rare hydrocarbon called Gilsonite. But it took $16,000,000 and a vast research program to do it. Deep in the mountains of Utah our scientists worked out a better, faster way to mine Gilsonite. Meanwhile our engineers designed the nation's first pipeline capable of carrying solids suspended in water . . . over rugged terrain to a spot 72 miles away.

There Standard* built the nation's first privately financed refinery to make petroleum products from a material other than crude oil. Today that refinery turns Gilsonite into high octane gasoline for motorists, and the purest coke known for making steel, aluminum and other metals. In our country's search for new sources of fuel, the development of Gilsonite is a major breakthrough. It means the equivalent of 100,000,000 barrels of oil added to U.S. underground reserves—important help in meeting our country's growing petroleum needs.

Progress in the West means...

New sources of gasoline to fuel 5½ million more motor vehicles by 1965†

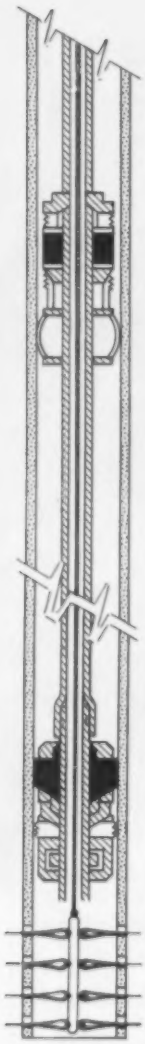
†In 11 Western States

STANDARD OIL COMPANY OF CALIFORNIA

plans ahead to serve you better

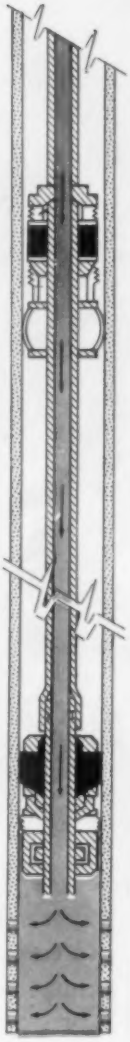
**Through American Gilsonite Company, a Standard affiliate*

Here is an **UNBEATABLE** Full-Opening Retrievable Bridge Plug Assembly...



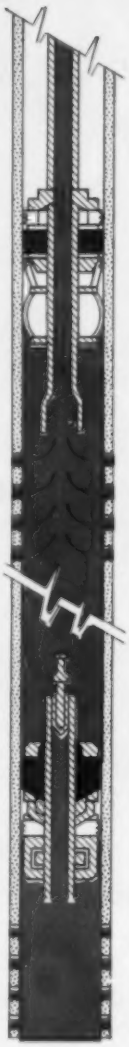
Shooting Lower Zone

BP-4 and Boll Weevil run in hole together. Through-tubing perforator run through full-opening Retrievable Bridge Plug.



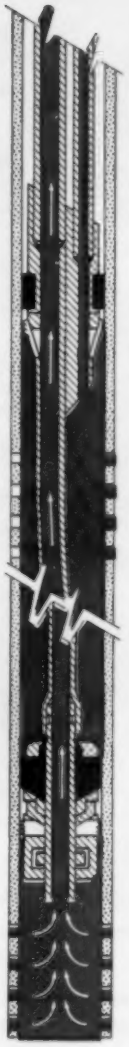
Stimulating Lower Zone

Built-in hydraulic hold-down actuated by pressure below the Bridge Plug Packer prevents tool from pumping up hole even under severe differential pressures.



Testing Upper Zone

Move full-opening Bridge Plug above upper zone, perforate with tubing gun, lower tubing, reset bridge plug between perforations, blank off lower zone with tubing plug, release tubing and set Brown Boll Weevil packer above upper zone. Dependable Brown Boll Weevil Packer allows swabbing or stimulation of upper zone.



Producing Two Zones

Type BP-4 Bridging Plug Packer left in hole as lower production packer. Boll Weevil replaced by dual string packer and tubing plug removed. Producing two zones with Brown PRIME* Completion Tools.

Brown Type BP-4 Retrievable Bridging Plug Packer

Brown Boll Weevil Packer

- Safely work each zone under pressure with this combination and eliminate the necessity of killing a good well.
- When testing and treating is completed leave the Type BP-4 Bridge Plug in the hole as a production packer.
- Tripping tubing to remove the upper packer is safely accomplished with the zones below bridging plug blanked off.

Contact your nearest Brown representative for full information on all Brown tools and services.

BROWN
OIL TOOLS, INC.

*Parallel Retrievable Independent Multiple-String Equipment

Catalog on Prime Completion tools just off the press.

operator of some other kind of business to deduct depreciation on his plant and equipment. To say that its only purpose is to provide capital for further exploration is to say that the discovery of oil is, to that extent, subsidized . .

"From what I know of the oil industry, both domestic and international, I do not believe that it wants or needs subsidy. Those elements in the industry who decry foreign depletion while they fight for a continuance of domestic depletion on the ground that it is necessary for the exploration and discovery of more oil, seem not to understand that they are thereby explicitly inviting government to redefine depletion as subsidy. In the long run this is the same thing as inviting government to step in and supervise the uses to which the subsidy may be put."

Ralph O. Rhoades, senior vice president and a director, Gulf Oil Corp., in a speech to members of the Boston Stock Exchange.

Proposed laws bear watching

"If we were to assume that all of the measures (legislation that has been proposed for the oil and gas industry) now contemplated were to become law, I think there is no question that we could expect higher prices, reduced supplies and finally, an oil-geared economy without any oil.

"The industry would find its hands so tied that it would be reduced to a state of decadence within a matter of years. Once so reduced, its chances of fulfilling the nation's growing future needs for oil and gas would be extinguished, and it would be the consumer of petroleum products—from gasoline to synthetic fibers—who would suffer the consequences."

A. L. Solliday, executive vice president, Pan American Petroleum Corp., in a speech to the Texas Mid-Continent Oil and Gas Association.

Gulf answers contempt charge

"We welcome the citation . . . by the Corporation Commission of Oklahoma demanding Gulf to purchase crude it cannot use, sell, or store.

"The position of this company is that the Corporation Commission by its mandatory purchase order usurped a power not granted to it by the laws of Oklahoma and denied to it by the Constitution of the United States. Gulf presented its views on this point to the commission at the time the mandatory purchase order was first attempted and immediately sought determination of the question before the courts of the United States.

"We welcome the citation for the

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UREABOR®
WEED and GRASS
KILLER

dry application
kills vegetation...
prevents regrowth

Here's the easiest way to eliminate your weed hazards—safely—economically! This dust-free granular weed killer controls both broad-leaf and grassy weeds...for a full season! You just apply UREABOR *dry*...there is nothing to mix—no water to haul. It works in all climates...in wet or dry areas. Rates of application are low; as little as 1 to 2 lbs. per 100 sq. ft. That's because UREABOR is a compound of two powerful plant-killers. It is noncorrosive to ferrous metals and nonflammable.

This Spreader simplifies and speeds application...

The PCB Spreader applies UREABOR to best advantage at prescribed low rates. It holds enough UREABOR to treat 1250 to 2500 sq. ft. without refilling—weighs a mere 6 lbs. Available now for just $10.75 delivered anywhere in the U.S.A.

Write today for literature:

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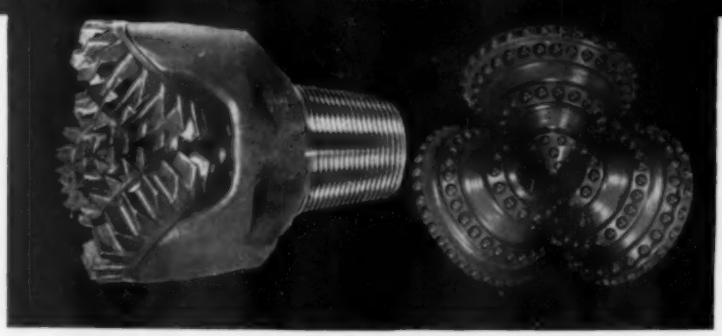
PACIFIC COAST BORAX COMPANY DIVISION
630 SHATTO PLACE, LOS ANGELES 5, CALIFORNIA



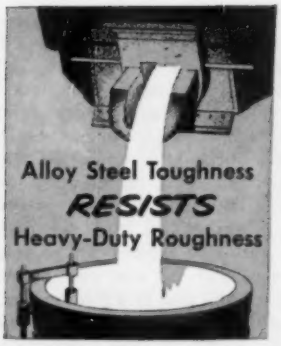
REPUBLIC ALLOY STEEL SPINNING CHAIN is more than twice as strong as low-carbon chain of the same size. It's built to resist the shock, abrasion, and fatigue of rugged round-the-clock oil-field operations; available from your oil country distributor in sizes 5/8-inch and 7/16-inch by 14 through 33 feet.

REPUBLIC ALLOY STEELS resist wear and abrasion, are tough and durable, with exceptionally high strength-to-weight ratios without sacrifice of safety. That is why they are used for gears, shafts, bearings, tools, and equipment like these diamond-sharp drilling bits.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels



from field to finished product...

REPUBLIC ALLOY STEELS

save Time...reduce Costs!

From the day the first shovel digs into the earth, to the time raw crude comes in and is piped to the refinery for processing, tough, strong tools and equipment made of alloy steels are at work—making your job easier, saving time, reducing production and operation costs!

Republic Alloy Steels provide dependable, economical, day-in and day-out service, on the surface or four miles down. That's why they are used for gears, shafts, and bearings in draw works. That is why they are specified for drill bits, tool joints, tongs, Kelly joints, blocks, pumps, sucker rods, and chain. And that's why alloy steels are recommended for both small hand tools and giant power equipment used throughout the petroleum industry.

Republic Alloy Steels are particularly important in today's deep-drilling operations. Their exceptionally high strength-to-weight ratio permits the use of lighter equipment and smaller sections without sacrifice of safety. This weight reduction means greater efficiency and economy in operation.

Republic Alloy Steels are unusually tough and strong. They can absorb sudden shock and impact without failure. They resist fatigue and corrosion. They perform safely in high temperatures or sub-zero cold. And they resist wear and abrasion.

For additional information and prompt assistance in applying these cost-cutting Republic Alloy Steels to your specific requirements, mail this coupon today. Republic metallurgists are at your service!

REPUBLIC ALLOY STEEL STUDS AND HIGH CARBON HEX NUTS resist high temperatures, high pressures, and corrosion — three common causes of stud failure. Clean, accurate threads provide maximum holding power, resistance to wear, easy tightening, trouble-free back-off for equipment maintenance. Specify Republic on your next order.

REPUBLIC ELECTRIC WELD CASING is formed from flat rolled steel of carefully controlled thickness and surface quality; resulting pipe provides uniform distribution of metal in threaded ends. In addition, normalizing and cold sizing increase ductility and yield strength to provide maximum collapse-resistance.

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3112 East 45th Street, Cleveland 27, Ohio

Please send me additional information:

☐ Alloy Steels ☐ Alloy Spinning Chain
☐ Alloy Studs ☐ Casing

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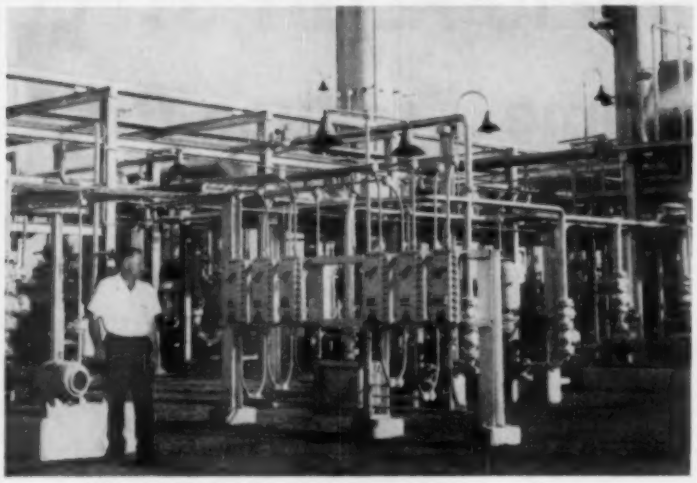
STEEL

and Steel Products

EASILY INSTALLED NELSON STARTERS SAVE FIELD TIME



A few of the many Nelson explosion-proof, combination starters used in the Sunray Mid-Continent natural gas plant at Redfish Bay, Texas.

Nelson explosion-proof combination starters are designed and built with the field man in mind. The starter comes fully assembled and wired, ready for quick easy installation.

If the cable pulling job is difficult only a few minutes are required to remove the four screws holding the pan mounted assembly. This leaves the whole enclosure available for cable pulling.

Nelson selects and uses only those components recognized for reliable trouble free performance, thus reducing maintenance to a minimum.

For Class I, Group D hazardous locations Nelson combination starters offer you the very best in safety, low installation cost, and minimum maintenance.

For more information on Nelson Combination Motor Starters write for Bulletins 420 and 1026.

1937 OUR 20th YEAR 1957

a major source of electrical control equipment for industry

NELSON Electric MANUFACTURING CO.
TULSA, OKLAHOMA

reason that we believe the courts will sustain our position in the litigation which will follow.

"Underlying the whole question is whether oil should be produced in excess of demand. There is no way to compel the purchase of unwanted commodities, and oil is no exception to that rule. The only way to prevent physical waste of oil and gas is to produce only that which can be sold. Gulf hopes that oil can continue to be produced and sold in a free market."

Gulf Oil Corp. statement following a citation issued by the Corporation Commission of Oklahoma holding Gulf in contempt of commission orders.

Danger in profit slicing

"... Business investment depends largely on the level of corporate profits. If business investment drops off, then we slow down the growth of the economy, the demand for goods and services declines, earnings become smaller, and eventually unemployment develops.

"... Any idea that profits should bear the brunt of cost increases shows a failure to understand the role that profits play in maintaining a growing economy."

L. F. McCollum, president, Continental Oil Co., in a letter to employes reprinted in the September "Conocoan," company newspaper.

CALENDAR

OCTOBER

23-25 National Association of Corrosion Engineers, western region, seventh annual conference, U S. Grant Hotel, San Diego, Calif.

23-25 National Association of Corrosion Engineers, seventh biennial Permian basin corrosion tour, Lincoln Hotel, Odessa, Tex.

24-25 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

24-25 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

25 Natural Gasoline Association of America, southern regional meeting, Washington - Youree and Captain Shreve Hotels, Shreveport.

25-26 West Texas Geological Society, fall field trip, Glass Mountains area, Holland Hotel, Alpine, Tex.

25-26 Abilene, Tex., Geological Society, Fort Worth Geological Society, joint field trip, San Saba County, Texas.

27-29 Independent Petroleum Association of America, annual membership meeting, Statler Hilton Hotel, Dallas.

28-30 National Lubricating Grease Institute, twenty-fifth annual meeting, Edgewater Beach Hotel, Chicago.

31-Nov. 1 American Association of Petroleum Geologists, Mid-Continent regional

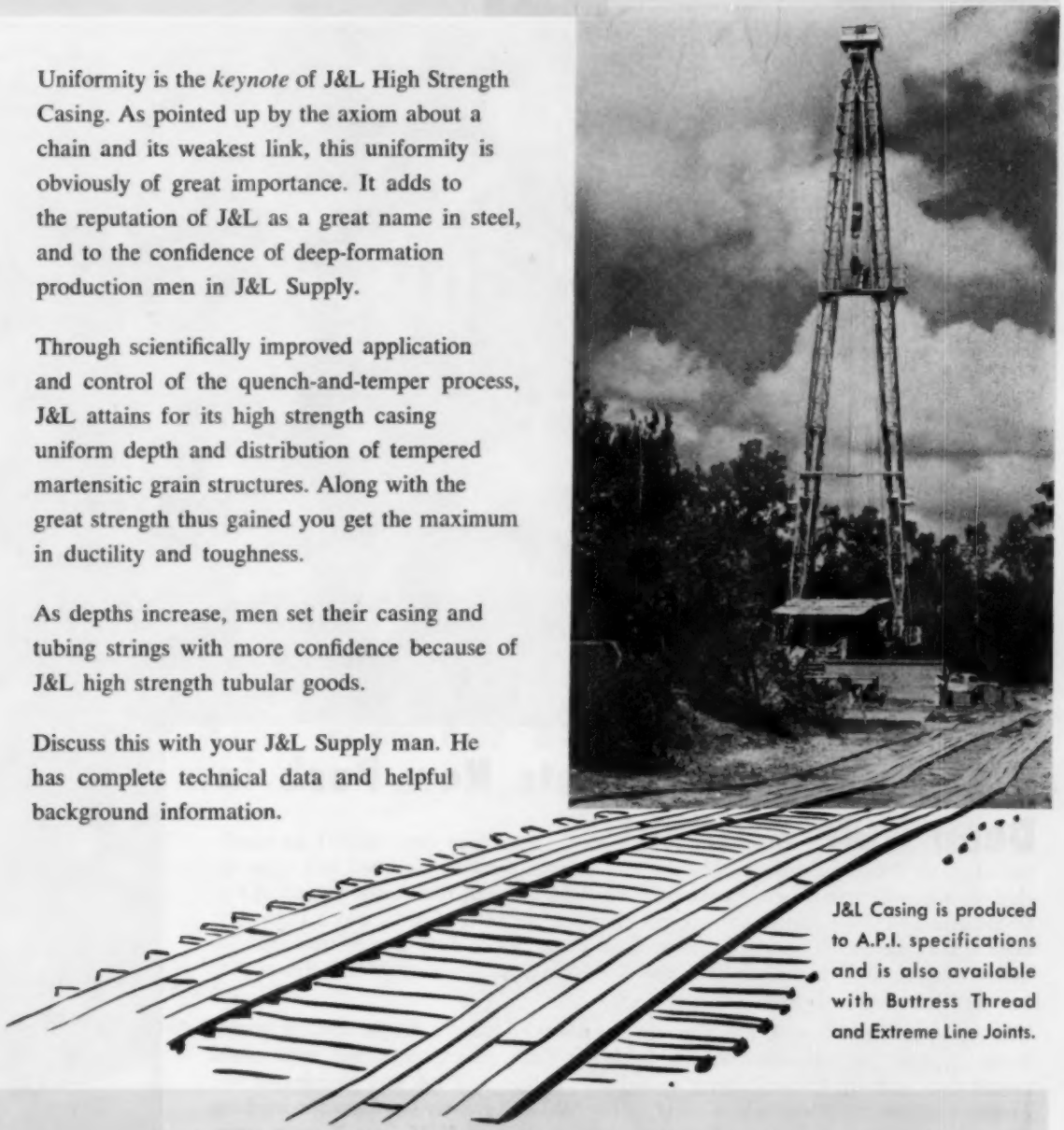
What to expect of
J&L HIGH-STRENGTH CASING

Uniformity is the *keynote* of J&L High Strength Casing. As pointed up by the axiom about a chain and its weakest link, this uniformity is obviously of great importance. It adds to the reputation of J&L as a great name in steel, and to the confidence of deep-formation production men in J&L Supply.

Through scientifically improved application and control of the quench-and-temper process, J&L attains for its high strength casing uniform depth and distribution of tempered martensitic grain structures. Along with the great strength thus gained you get the maximum in ductility and toughness.

As depths increase, men set their casing and tubing strings with more confidence because of J&L high strength tubular goods.

Discuss this with your J&L Supply man. He has complete technical data and helpful background information.



J&L Casing is produced to A.P.I. specifications and is also available with Buttress Thread and Extreme Line Joints.

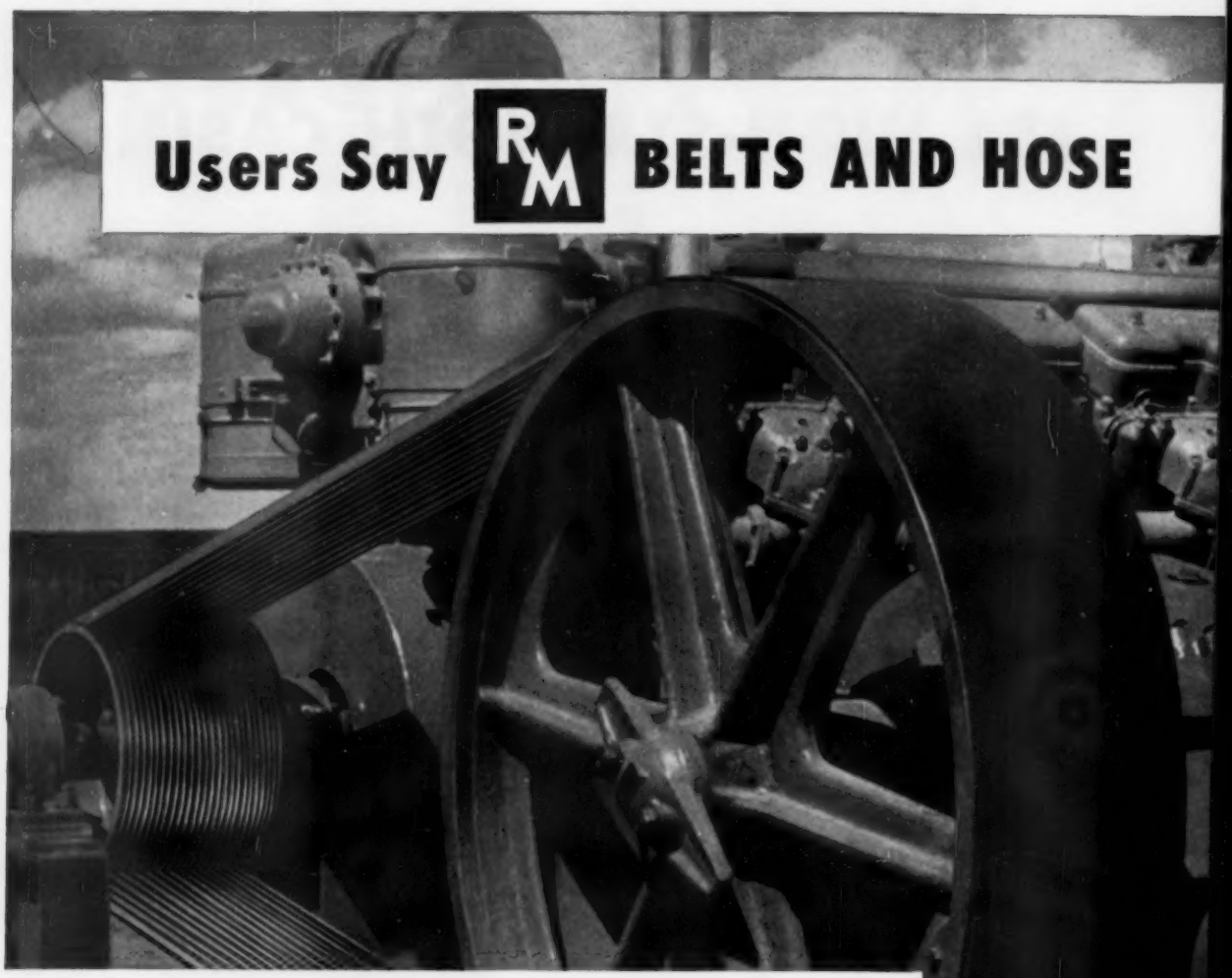
Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN STEEL

46

Users Say R/M BELTS AND HOSE



R/M *Poly-V*® Drive Puts New Push in Deep Hole Drilling!

No other belt can deliver as much power in as little space as R/M Poly-V. A *single, endless* V-ribbed belt runs on sheaves specially designed to mate precisely with the belt ribs. Uniform pull of the single unit belt gives higher horsepower capacity per inch of drive width than ever before possible. This patented new concept in heavy-duty power transmission delivers up to 50% more power in the *same* space as ordinary V-belt drives . . . *equal* power in as little as ⅔ the space!

The patented R/M Poly-V Drive meets the needs of today's deeper drilling operations . . . puts that extra power push behind a slush pump, to permit more rapid circulation of mud, faster drilling speeds and longer drill bit life. Eliminates the problem of matching multiple V-belts in the field and greatly increases the working life of both belts and sheaves. Just *two* cross sections of R/M Poly-V meet *every* power requirement — field inventories are reduced to a minimum!

Write for Bulletin #6638

*Poly-V is a registered Raybestos-Manhattan trademark.

. . . And For "The Smoothest Running V-Belts Made," Specify CONDOR and R/M SUPER-POWER V-BELTS

Give You "*More Use per Dollar*"

Ray-Man Rotary Hose Handles Easiest on the Rig

. . . and *safest*, too. R/M's method of applying high tensile steel cable wires under precisioned tension makes Ray-Man CBL Rotary Hose unequalled for strength, flexibility and safety. It holds steady in the derrick without whipping . . . even under the high-pressures of deep drilling. And when it comes to moving from location to location Ray-Man's flexibility and light weight minimizes the dangers of accidental crushing and kinking in transport . . . assures easier, faster rigging up on the next job.

Ray-Man's streamlined, built-in coupling adds to your safety on the job, too. Designed without protruding lugs or flanges that cause fouling, it features R/M's special leak-proof "Lip-Lok" seal that actually tightens under pressure to prevent dangerous — and costly — blow-outs!

Add Manhattan's oil-proof tube for drilling-in with oil or oil-base and you've got easier, safer handling and longer, trouble-free services at less cost on *every* drilling job . . . with Ray-Man CBL Rotary Hose.

Write for Bulletin #6743 for details

There's an R/M Hose For Every Oil Field Use!

You'll find "More Use per Dollar" features in these R/M hose constructions, developed especially for oil field service:

Manhattan Mud Pump Intake Hose — designed with Type 'C' Leakless Built-In Nipples for rough service with the most powerful mud pumps.

Manhattan Geophysical Hose — dependable strength, longer service in drilling small test wells.

Ray-Man Rotary Vibration Hose — to withstand high pressures between mud pump and rig standpipe.

Discuss your hose needs with an R/M representative.

RM 721

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Designed for Gracious Living

DUPLEXES SAVE YOU MONEY

This drawing shows another variation of the basic STURDYBILT Home. This duplex has smart entrances and picture windows for each unit. STURDYBILT duplexes can save money on many housing projects. Write for information.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA.

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Oil execs agree: if it's fast delivery you want, you want Worthington QD (Quick Detachable) sheaves—the original two-piece design. MV.7.1

WORTHINGTON CORPORATION, Oil City, Pennsylvania

meeting, Education Building, Fairgrounds, Tulsa.

NOVEMBER

- **3-8** Society for Nondestructive Testing, second international conference, Hotel Morrison, Chicago.
- **6-8** Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.
- **6-8** Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.
- **11-14** Society of Exploration Geophysicists, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.
- **11-14** American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.
- **12-14** National Association of Corrosion Engineers, northwest region fall meeting, Penn-Sheraton Hotel, Pittsburgh.
- **22** Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

- **1-3** Interstate Oil Compact Commission, annual meeting, Tulsa.
- **1-6** American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York.
- **2-6** Twenty-sixth Exposition of Chemical Industries, Coliseum, New York.
- **8-11** American Institute of Chemical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

JANUARY

- **16-18** Association of Oilwell Servicing Contractors, second annual convention, Baker Hotel, Dallas.
- **19-22** Pipe Line Contractors Association, tenth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.
- **31** Natural Gasoline Association of America, regional meeting, Skirvin Hotel, Oklahoma City.

FEBRUARY

- **16-20** American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Hotel Statler, New York.
- **26-28** American Petroleum Institute, Division of Production, southern district meeting, Shamrock-Hilton Hotel, Houston.
- **28** Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

- **3-4** Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.
- **5-6** Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.
- **7** Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.
- **12-14** American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.
- **17-21** National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.
- **24-26** Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.
- **31-April 2** American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

MISSION Super-Service® LINER PACKING

MISSION Super-Service Slush Pump Liner Packing outwears all other types.

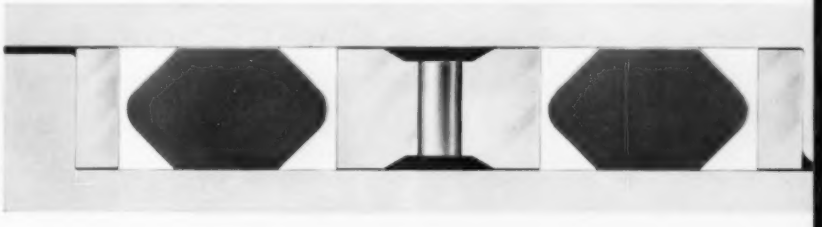
Under severe conditions (high pressures and worn pump bores) Mission Packing has outlasted others by as much as ten times.

Furthermore, Mission Super-Service Packing stays in adjustment. Since costly wear is reduced, frequent re-tightening is seldom required.

The reason for this outstanding performance is the *zero* clearance design shown below.

Write for the bulletin that tells the whole story. Better yet, try Mission Super-Service Liner Packing in your pumps. They are made in many popular sizes and are sold through all supply stores.

This cross-section shows how nylon back-up rings expand to provide zero clearance and perfect containment of packing elements when tightened. The metal end ring restores worn shoulders—adding reinforcement to the nylon. The result is long life with minimum adjustment.



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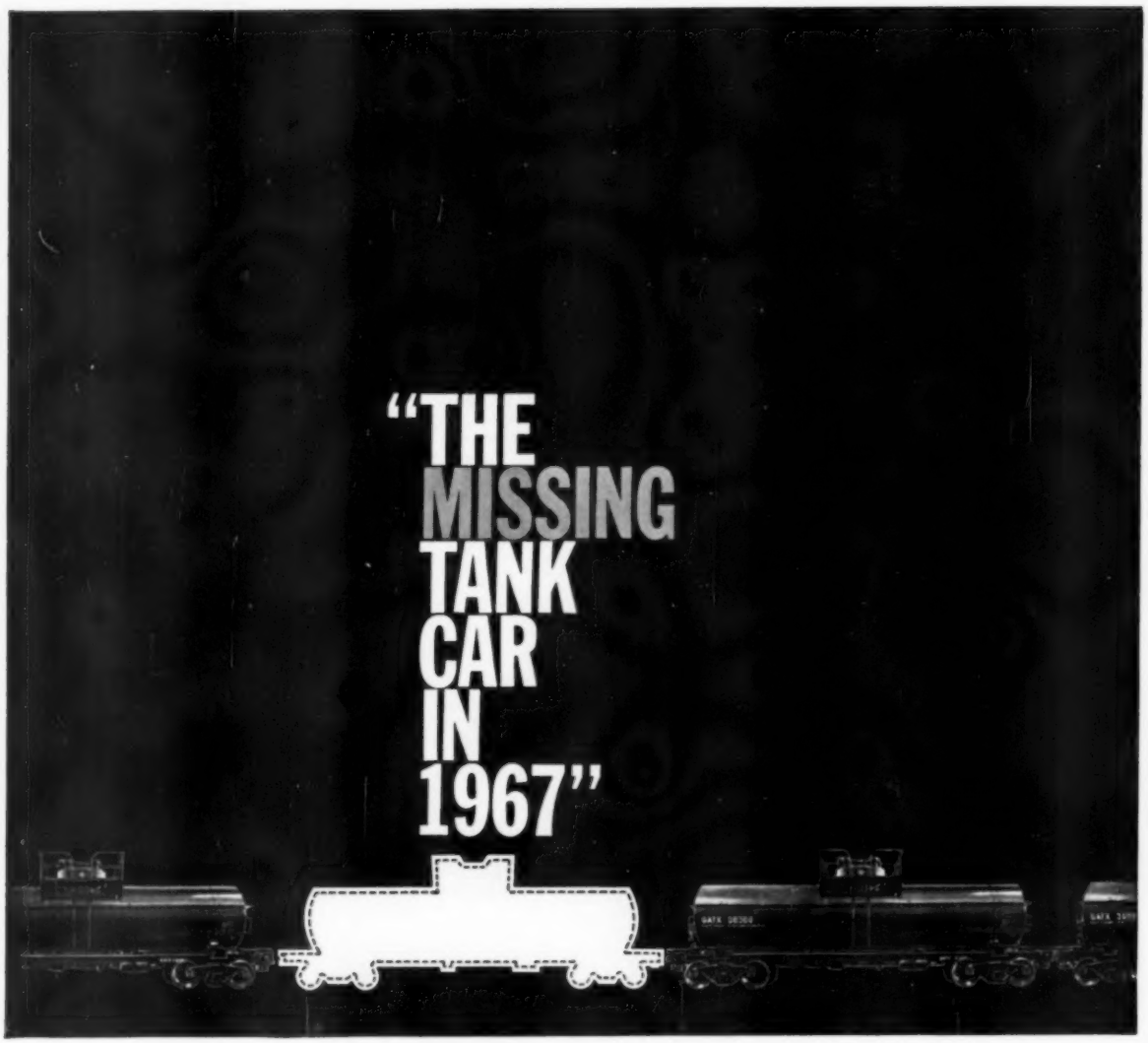

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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY SPEAKING

So We Have Ethics

ONCE UPON A TIME, it is sad to relate, businessmen were a bunch of dirty crooks.

Oil men were dirty crooks, newspapermen were dirty crooks, all lines of business and professional activity were dominated by dirty crookery.

It was considered not only standard business practice but good clean sport to rook the customers, bamboozle the public, and hand competitors the dirty end of the stick. The spirit of the times was expressed in P. T. Barnum's remark that "there's a sucker born every minute."

But some 50 or 60 years ago things began to change. Today the American public won't stand for being played for suckers, and businessmen insist on ground rules of fair competition. So we have government regulation of business and—much more important—voluntary cooperation in good business practices.

Oil men have had a hand in this. The old timers will remember that when the American Petroleum Institute was founded back in the 1920's one of its first jobs was to bring order out of chaos in oil-field equipment by setting up standards and specifications. This voluntary program worked so well that today an operator knows he is getting exactly what he asks for when he buys supplies bearing this famous monogram:

From there the oil industry moved on to voluntary compliance with many other standards of ethical competition and good business practice, which is why the industry can boast that it is progressive.

But we in the publishing business can boast of being even more progressive in this respect.

As we said, newspapermen used to be dirty crooks. They would make fantastic claims for circulation and readership—and charge advertising rates accordingly. Advertisers had no way of knowing who read any publication. About the only check was the tonnage of paper run through the presses, but publishers got around that by giving their papers away or throwing them away.

But around 1914 the Fourth Estate began to get some ethics—believe it or not. Publishers of newspapers and magazines joined together to form the Audit Bureau of Circulations to eliminate lying and fakery. This bureau set up standards and specifications for circulation, and hired inspectors to audit publishers' statements.

Ever since then a buyer of advertising space can tell exactly who buys the publication, what he paid for it, where he lives, and other details of readership of any paper or magazine bearing this famous monogram:

A remarkable thing about the A.B.C. is that advertisers have a majority of the board of directors while publishers pay some 85 per cent of the operating cost. How do you like that—producers paying their customers to tell them how to run their business. The oil industry hasn't come to that yet.

But it works fine with us. Take the Journal, for instance. If you're interested, you can tell from our audited circulation statement exactly how many geologists, or pipeline contractors, or refinery engineers, or whoever, pay money to get the Big Yellow Book. That's highly important to advertisers.

We editors like it, too. We know that nobody sees the Journal unless he thinks enough of it to pay for it. And if he pays for it he must read it. So we work as hard as we can to give him what he wants to read.

There are many "give away" publications—but they can't belong to A.B.C. Nowadays their publishers tell the truth about who they give them to, but they can't conceal the fact that when a man gets something for nothing he is apt to consider it worth just what it cost him—and throw it away without reading it.

That's why we're proud that the masthead of our favorite oil publication carries the A.B.C. symbol of fair competition and ethical business practice.

—Henry D. Ralph.

Allis-Chalmers announces... **Newly**

1

Gang-operated disconnect switch isolates starter from incoming power — assures safe entry of high voltage compartments.

2

Steel cubicle is compartmentalized — separates high and low voltage equipment.

3

Short-circuit protection is provided by fast-acting current-limiting fuses, rated 150,000 kva at 2300 volts and 250,000 kva at 4160 or 4600 volts.

4

Overload protection is handled by accurate relays which trip only on excessive motor current, preventing needless motor stoppages.

5

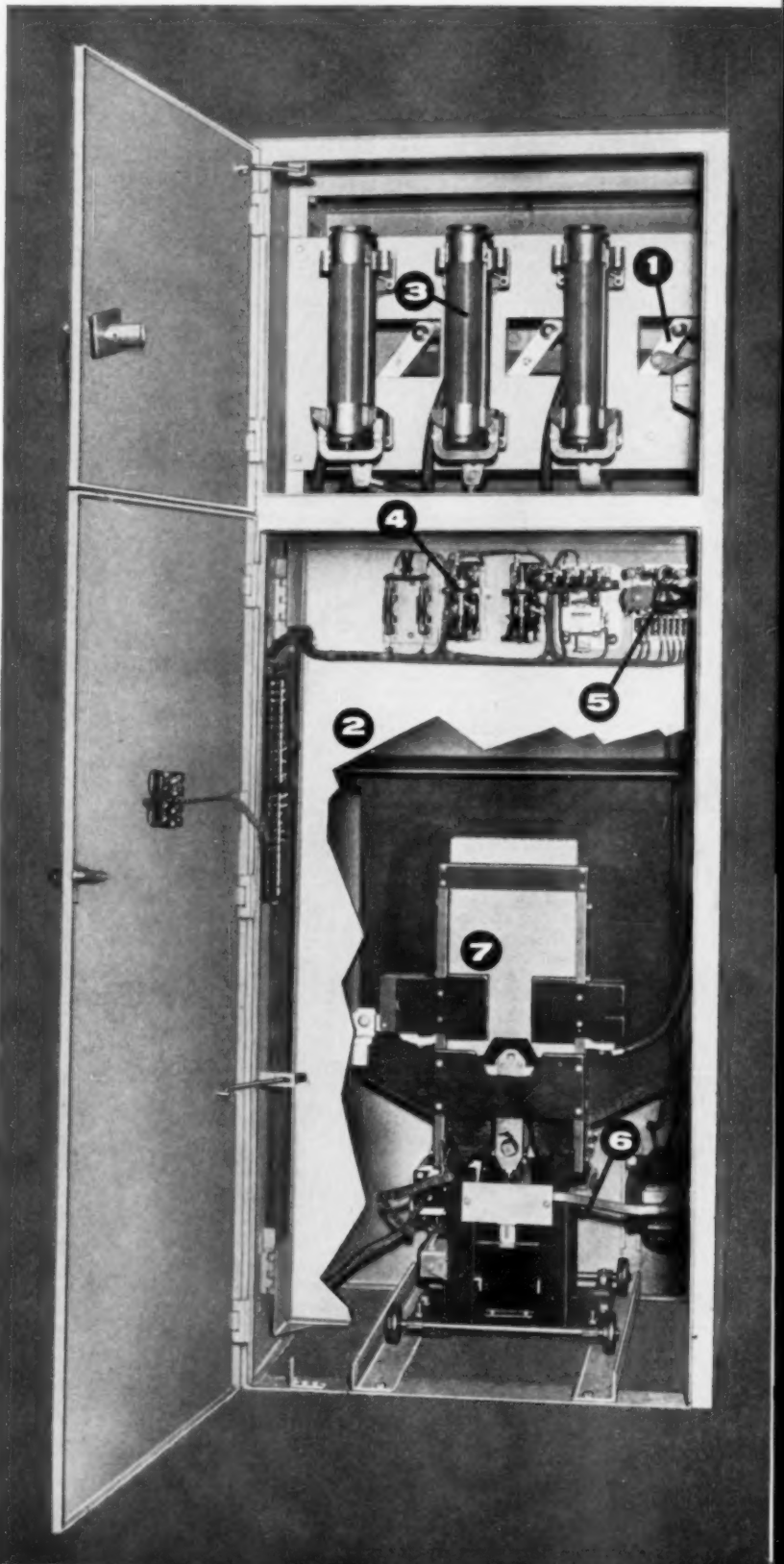
Undervoltage protection instantaneously opens line contactor on loss of voltage. Time-delay undervoltage protection also available.

6

Mechanical interlock coordinates contactor, disconnect switch, upper door and inner control barrier for maximum safety.

7

Roll-out contactor makes maintenance easy—even in narrowest aisle space. (Routine inspection and maintenance can be done with contactor in place.)



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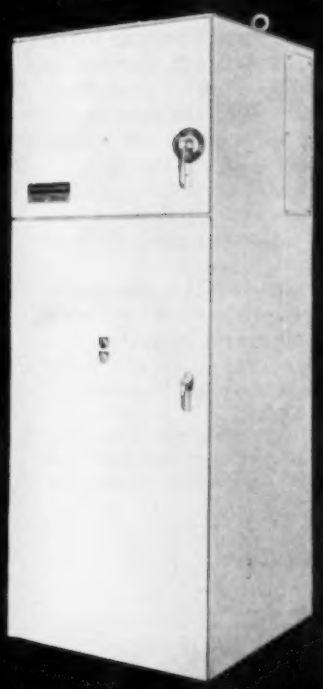
Type H High Voltage Motor Control

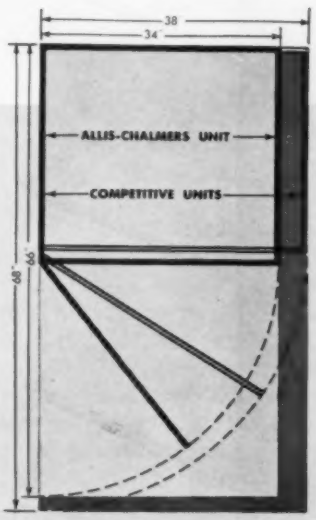
Combines front access with space economy...



In addition, you get maximum protection for personnel and machines, thoroughly tested components, and ample panel space for modifications. It's all built into the *smaller cabinet* of a newly designed line of Type H high voltage starters from Allis-Chalmers.

Here is control that couples compactness with roominess (for ease of maintenance) . . . here is a starter that joins test-proven performance with versatility (for addition of meters and relays) — AND the line meets every 2300 to 5000-volt motor need.

For more information on this engineering advance, contact your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



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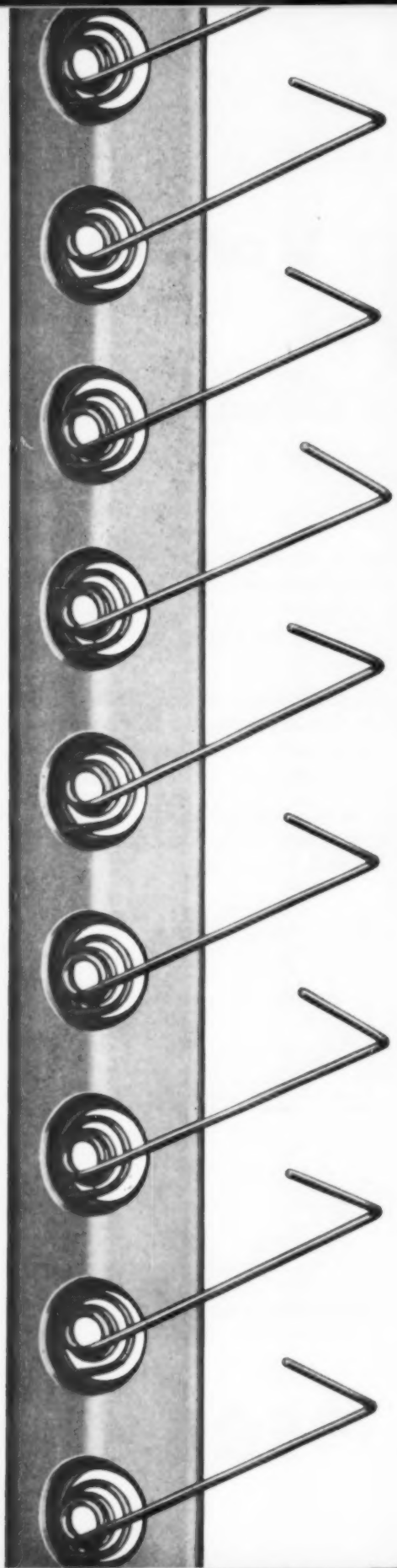

is WALL SCRATCHING "POINTLESS?"

NOT WHEN YOU USE Baker ROTATING Wall Scratchers

WITH "PLOW ANGLE" WIRES!

Operators who prefer "Rotating-Type" Scratchers will find the new Baker *ROTATING* Wall Scratcher (Product No. 903) far more effective than typical scratchers with "pointless" trailing wires. See in Fig. 1, how the right-angle bend at the ends of the wires in Baker *ROTATING* Scratchers provides a "plow angle" point which *must* dig in and effectively remove mud cake. Compare these results with the "pointless" action of trailing wires which are *merely dragged over* the mud cake without removing it; see Fig. 2.

Note also in Fig. 3, how the "plow angle" scratching point is maintained over a wide range of clearances—even under slim hole conditions—as each wire automatically adjusts to meet the wall of the hole.

Shock absorbing spiral springs, mechanically held by the *double* body thickness, prevent distortion of the scratcher wires both while running-in the hole and throughout the scratching operation.

Ask the Baker representative in your area for details of spacing and installation. Try this successful aid to "first-time" cementing.

If you prefer RECIPROCATING *Type Wall Scratchers, Baker Solid-Ring* SLIP-ON *Scratchers, or Baker* HINGE-LOK *Wall Scratchers will bring you* CONTROLLED SCRATCHING *by removing the mud cake only throughout the area to be cemented.*

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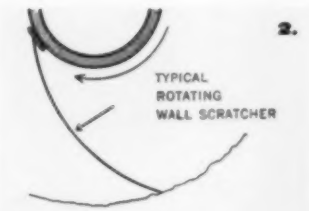

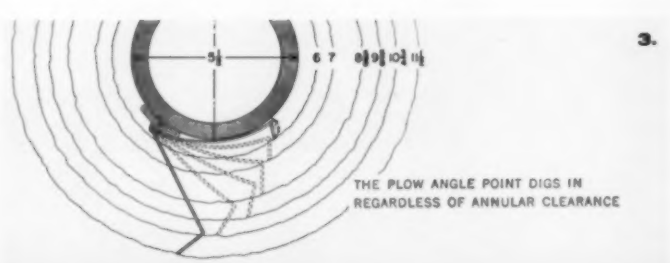

Two theories of handling a surplus

DIAMETRICALLY opposite and conflicting methods are being used by producers in Oklahoma and Texas in dealing with the problems of too much oil.

In both states, as in others, producing capacity is substantially above market demand and transportation capacity. Some purchasers are prorating, taking less from each well than the allowable maximum. Pipelines are reluctant to extend gathering lines to unconnected wells because their shippers already have access to more oil than they can use.

This condition is unjust and inequitable to those producers who are thus denied their fair share of what market there is. It violates the principle of correlative rights which conservation laws are presumed to protect.

IN OKLAHOMA the producers and the regulatory commission are operating on the theory that by keeping allowable production high they can "flood out" competition. They are not willing to lower their price to compete with crude from other areas but hope to use various pressures to make buyers take the surplus.

Ever since the Suez crisis ended, Oklahoma's allowables have been well above buyers' estimates of the market for Oklahoma crude. The majority of the buyers have tried to handle this additional oil without prorating, but none of them is interested in connecting additional wells.

In Texas the producers and the regulatory commission are following a different tack. Realizing that they can't sell or transport all the oil they can produce, Texas producers support their market demand statute by concurring in low allowables. Since the peak of the Suez crisis, Texas producing days have been reduced 50 per cent.

The Texas theory is that the curtailed market should be divided as equally as possible among all producers. In a sense this is a "share the misery" program because nobody gets full production. But it does serve to protect equities and correlative rights.

TEXAS HOPES that low allowables will end purchaser proration and will open at least a limited market to presently unconnected wells. Instead of trying to force buyers to take the maximum from connected leases, it is trying to make them take the minimum from every lease.

Whether the Texas theory will result in expanded gathering facilities remains to be seen. But it has more hope of success than the Oklahoma theory. In Oklahoma more than one substantial purchaser is seriously considering pulling out of the state because of official pressure to make it buy unwanted oil.

It should be obvious that, with oil at least, high production does not induce high consumption. The way to get buyers interested in a product is to avoid having a surplus of it. The Texas theory has both logic and law in its favor.

Built to take a battering, this rock bit is...

Made of Nickel alloy steel for high strength, toughness, hardness

When you're wondering what material you can use to stand up under equipment-wrecking conditions, take a tip from rock bit manufacturer, H. C. Smith Oil Tool Company of Compton, California . . .

Rock bit bodies must resist shear and high impact while shouldering drilling weights over 80,000 pounds.

That's why H. C. Smith uses 8720 Nickel-chrome-moly steel for the bodies. With selective carburizing and heat treatment, it provides wear resistance in areas subject to abrasion . . . assures toughness and strength needed to handle violent twisting and pounding.

Rock bit cutters must withstand tooth-breaking shock and dulling abrasion as they go through chert or limestone . . . sandstone or sandy shale.

That's why cutters are 4815 Nickel-moly steel. Through carburizing, it attains a wear-resisting 60 Rockwell "C" case hardness with a tough, shock-resisting 35 Rockwell "C" core.

That's how H. C. Smith, and other manufacturers, put nickel steels to work in one of the toughest oil field applications. How about your toughest job? You can probably think of equipment in which failures or constant maintenance have been a headache. That might be the place to try nickel alloy steel. Why not tell us your problem? We'd like to work with you and help find a solution.

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The OIL AND GAS JOURNAL

October 21, 1957

Drilling Slump Is Hurting Rig Makers

● Domestic contractors just aren't buying. A pickup in activity would help, but only if it includes some deep drilling. Foreign exploration is the one bright spot at the moment.

A SURVEY of major supply houses and drilling contractors made by The Oil and Gas Journal shows that:

... **There's an oversupply** of rigs in the U. S. right now.

... **Most contractors** don't plan to buy complete new rigs unless there's a big upturn in drilling. A gradual return to normal won't mean a boom in rig sales, and any upturn in activity must include some deep drilling if sales are to rise.

... **There is some cannibalizing** of old rigs for parts, but the practice isn't widespread and few rigs are being junked because of it. Most contractors keep their rigs in shape by buying new equipment for them.

Some contractors say competition for contracts is so keen that they can't buy new rigs, that the depreciation is so great they can't compete with old rigs. Rig makers contend that a new, modern rig has just the opposite effect.

In any case, it's the foreign drilling that has been a "life saver" for some supply houses. At least one says its dollar volume on total sales is up this year solely because of its export sales.

Most drilling contractors wouldn't dream of buying a new rig for domestic use at this time.

Said one: "It's an equipment problem more than anything else. If there are 4,000 rigs and a need for 3,000, then there won't be much bought until 1,000 rigs are withdrawn. If there's an upturn, there won't be any new equipment bought until the point is reached where new rigs are required. I can't see any rush to the supply houses."

The write-off . . . One drilling contractor said depreciation is a major factor that deters new rig buying.

"When a man with an old rig depreciates at $140 a day and with a new rig at $240 a day, that slows down buying," he said. "It's better to modernize old equipment by adding an engine or two and a new pump—and this keeps depreciation in line."

None of the contractors surveyed admitted cannibalizing old rigs, but some said it is done by others. All said they buy new equipment constantly. One said he owns rigs that have nothing left of the original except the number.

Another top drilling contractor said he has bought some second-hand rigs recently rather than new ones because the investment is not as great. He explained: "We operate basically on return on investment. When you buy second-hand rigs, it means a lot less you have to get back per day. We couldn't afford to buy new rigs."

A supply-house executive looks for a big upturn in rig sales when the drilling slump is over—provided the new drilling is deep.

"We could drill one-third more holes in the 5,000-7,000-ft. class without bringing much of an increase in drilling rig sales," he said. "But if the increase is in deep drilling, like some of that we have now in Oklahoma, there would be a much bigger need for new equipment."

Another supply-house official said predictions of an increase in drilling have caused the company to continue manufacturing rigs to meet an expected new demand. He added somewhat wistfully: "But it will have to start pretty soon, or we'll have to go down."

Foreign sales . . . While unhappy about domestic business, representatives of the supply houses can grow rapturous when asked about their sales for export.

"If it wasn't for foreign sales, we'd all be dead," said one.

"Export business this year has been a lifesaver," said another.

"It's just been tremendous," said still another. "Countries we never heard of are hunting a drilling rig."

Some of the companies are reluctant to release specific figures on rig sales, but their elation over the foreign market shows obviously what is keeping their rig divisions operating.

An executive of one company which has little overseas business was critical of imports because of their effect on domestic drilling. He said the company is planning to establish an outlet in Venezuela to grab some of the foreign trade.

Export sales are excellent for two reasons. Not only are there more of them, but most of the rigs sold are big ones. Foreign exploration usually requires new or almost new rigs which are capable of drilling great depths.

The drilling contractors and supply houses say very few used domestic rigs are being shipped overseas because specifications call for top equipment.

Many of the foreign sales are for offshore rigs, and these are expensive too.

In fact, what little domestic business there is today consists mostly of offshore rigs, although there is a slump in offshore as well as onshore drilling at the moment.

What about price? . . . Opinions differ widely on what effect price has on purchase of new drilling rigs.

Some contractors contend price is a big factor; others say they wouldn't let price stand in the way if they really needed a new rig.

One contractor contended that a deep drilling rig today costs more

than double what it did in 1949-50. He was supported by another who said he hasn't bought any new rigs principally because the price was too high.

But one driller said this: "It's not so much the cost of rigs, but the fact that there is no demand for them. If work were available, I don't think price would stand in our way."

Rig prices rose generally by 6½ to 8 per cent in July and by slightly more than that a year ago.

But one supply house official insisted the industry "didn't put up a great deal of squawk."

Another said price "is not paramount" and, besides, drillers are getting far more for their money today than before.

"There has been a revolution in design of drilling rigs in the past 3 or 4 years that is greater than in the previous 15 years," he said. "All the designers have gone to flexible drive, and the demand for horsepower to drive large pumps has tripled in the last 4 years. We're drilling large diameter holes, and many operators are woefully underpowered and underpumped."

To meet these new demands, however, the supply-house spokesman admitted that drillers are resorting to "piecemeal" buying—by adding more horsepower or pumps—rather than acquiring entirely new rigs.

Another supplier made the frank admission that "the pressure is on" to cut manufacturers' prices on new rigs. This statement contrasted with those of other supply houses. Contractors, he said, have become extremely cost conscious in negotiating to buy what few rigs they're buying for domestic use.

Tight money . . . Still another factor on which the industry disagrees is the effect of so-called "tight money" on rig sales.

In fact, within the same supply house two differing opinions were voiced.

"There's a tight-money market for capital expenditures of all sorts," said one. "Certainly it affects sales."

But another official in the same company said that contractors "don't borrow money on drilling equipment, and I don't think supply houses are pinched. Most rigs are financed through supply houses."

In direct conflict to this statement was one of another supply-house executive who said: "Tight money is hurting the supply companies. Producers are converting inventories into dollars and forcing the supply houses to carry the inventories for them."

Unusual Pontiac Refinery Goes on Stream

HATTIESBURG, Miss. — Most processing units are already on stream at Pontiac Eastern Corp.'s new refinery here, and the few remaining units are expected to be in operation by mid-November.

The 14,500-bbl. plant, designed to process crude oil and field distillates on a segregated basis, does not have the usual basic crude distillation unit (OGJ, Mar. 18, p. 96). Instead, incoming crude oil will be flashed in a tar separator and then charged directly to a Thermofor catalytic cracking unit and a fluid coker.

Field distillate will be fractionated, and the naphtha recovered will serve as charge stock for a 2,500-bbl. Platformer.

Units already operating include the T.C.C. unit, tar separator and feed-preparation unit, distillate fractionator, gas concentration unit, sulfuric acid alkylation unit, and caustic and amine treating facilities. Due on stream by mid-November are the fluid coker, Platformer, Unifining unit, and sulfur plant.

Charge stock includes 11,000 bbl. of 16°-gravity crude, primarily Baxterville, although some Heidelberg will be handled, and 3,500 bbl. of field distillates. Gasoline output is expected to be 10,000 bbl. daily.

Fluor Corp., Ltd., had the engineering and construction contracts for the job and handled process and mechanical design except for some licensed units.

Tidewater Holds Key

. . . In clearing up imports picture. Carson says decision to accept lower quota will mean controls are a success

WASHINGTON.—The biggest question mark in the import-control picture—Tidewater Oil Co.—may be cleared up soon.

The company is now reviewing its imports plans and will disclose soon whether it will accept the Government's refusal to increase Tidewater's quota.

This was indicated last week when Tidewater filed its monthly imports report with Capt. M. V. Carson, Jr., administrator of the control program. The usual estimate of imports for the next 5 months was omitted. Carson was informed at the same time that Tidewater was restudying its import program.

Tidewater had planned originally to import 84,600 bbl. daily through the last half of 1957. But under the new program it was allocated 34,200 bbl. A subsequent request for a 27,800-bbl. increase was denied.

Carson in ruling on the request said the assigned quota puts Tidewater "within the general range of competitive parity with the companies against which it competes, at least as to imports."

Only a couple of the other companies which asked increases have reported they will accept Carson's verdict. Others are yet to be heard from.

The first action on a new entrant into the import field was expected to be taken over the weekend. Crown Central Petroleum Corp., the first and so far the only company asking for a first-time quota, is expected to be given something less than 12,000 bbl. daily. It requested 20,000 bbl.

The Crown Central decision will clean up all the loose ends of the import program. If Tidewater makes a hefty cut in its presently planned 62,000 bbl. daily imports, Carson says the control program will be a big success.

Patterns appear . . . Some new yardsticks for control were laid down by Carson in his refusal to give Tidewater a higher quota.

The competition in District 1 is in the marketing of products and not in imports, Carson held. Thus, while Tidewater markets from its East Coast refinery other companies bring in a large share of their products from refineries outside the district.

The result is that, on a products basis, Tidewater's quota is "almost exactly" equivalent to the average of import-derived products for all companies.

It is this general range of parity which the cabinet committee must have had in mind in referring to "competitive opportunities," Carson said.

The administration also held that there was nothing in the grant of quick writeoff for Tidewater's Delaware refinery which gave "official understanding" that it would be supplied from imported crude.

"The refinery supply is, of course, tanker-derived. But, so far as that record shows, Tidewater could as well have intended to use certain West Texas crudes of high-sulfur and low-gravity as Middle East crudes of similar types," Carson said.

And as to the company's assertion that the plant can't operate economically on high-gravity crudes, he added, no showing has been made that it can't obtain lower grade domestic oil "in a quantity which, when combined with the imports allowed under the formula, will meet a considerable part of the requirements of the refinery in that respect."

About profits . . . "Compliance with its volume assignment may require the company to ignore opportunities for higher profits from the foreign crude," Carson said in summing up.

"But, then, it was necessarily contemplated that some loss of profit, including possible losses from tanker commitments, would be encountered by each company complying.

"Indeed, the program's voluntary nature was largely intended to permit the necessary flexibility for each company to adjust to the program's needs and requirements. Mandatory controls, if necessary, would involve the same loss of profit opportunity, without that desirable flexibility.

"Certainly, Tidewater has not shown such a special degree of loss of opportunity to justify singling it out for special adjustment as against other companies with larger investments and supplies abroad.

"Moreover, it may be noted that Tidewater's program of foreign exploration and its domestic refinery reconstruction took place against the background of growing congressional and executive concern with the increase of imports."

Well-Pumping Costs Cut

New tool shuts off pump automatically when fluid level drops; one system can handle five wells, engineers told

LOS ANGELES.—Pumping-well operators may be able to cut costs by means of a new device which shuts off a pump when the fluid level drops too low.

The new "oil-level guard," consisting of an electrode, control panel, and recording drum or disk, has two basic functions: It continuously records the fluid level, and automatically starts or shuts off the pump.

The instrument can be hooked up to regulate as many as five wells, with five different fluid levels, from a single control panel.

Preview of the new oil-level guard was given by Hans Bannies of Pleuger Pumps, Inc., at the recent meeting of the southern California section of A.I.M.E.'s Society of Petroleum Engineers.

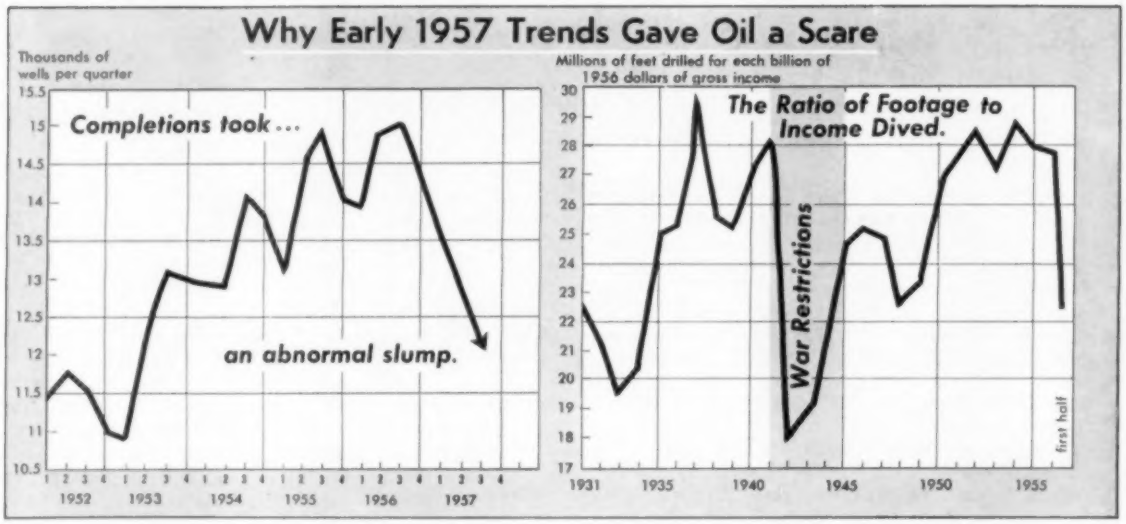
How it works . . . The electrode, containing a variable resistor, is lowered to a predetermined level in the fluid. As the fluid level increases or decreases, pressure on a diaphragm-controlled mercury column increases or decreases the resistance of a rod in the electrode.

This change is constantly recorded by a writing indicator on a drum or paper disk in the control panel.

The movement of the writing indicator is controlled on the panel by two adjustable brackets. These brackets are preset at the desired fluid level so that when the writing arm bumps them, the action either starts or stops the pump.

The electrode is designed to operate at reservoir pressures between 10 psi. and 1,400 psi.

Bannies said the oil-level guard is being used by one operator in a West German field. The fluid level there is maintained between 5 and 50 ft. over the pump intake. This is accomplished by setting the adjustable brackets on the instrument dial between 42.35 and 54.50 psi.



Drillers Can Look to a Bright Future

- Journal's economist tells A.A.O.D.C. that number of wells will increase 41.5 per cent by 1965 as demand for oil and gas increases. The trend for deeper drilling will also continue during the next 9 years.

- The drilling slump that hit in the second quarter of 1957 actually began last year. It can be traced to low crude prices, low allowables, and high costs.

TULSA.—Drilling contractors can write off 1957 with these few words:

A very poor first half. A reasonably good second half. And a year that's just so-so.

But what of the future?

All statistics point to increasing demand and production of crude and natural gas in the next 9 years. They indicate the industry will need to drill 62,700 wells next year, stepping this up yearly to 82,300 by 1965.

That's the outlook as presented last week by John C. Casper, economics editor of The Oil and Gas Journal. Casper addressed the annual convention here of the American Association of Oilwell Drilling Contractors.

The oil economist adorned his statistics with this bit of advice to the contractors: "Depth is still your drilling frontier."

Few geographic frontiers remain for the driller, he said. The drill has penetrated the frozen areas of Alaska, the deserts of the Middle East, the Rocky Mountains, the open waters of the Gulf of Mexico.

"Currently your challenge lies in the lower formations of the deep sedimentary basins," Casper said, adding this challenge posed these vital questions:

"How many of these deep zones contain oil? What changes must be made in equipment and methods to go down to 30,000 ft.? Can ultradeep production be profitable?"

Delayed action . . . The latest drilling slump actually started sometime last year. But its full impact was only

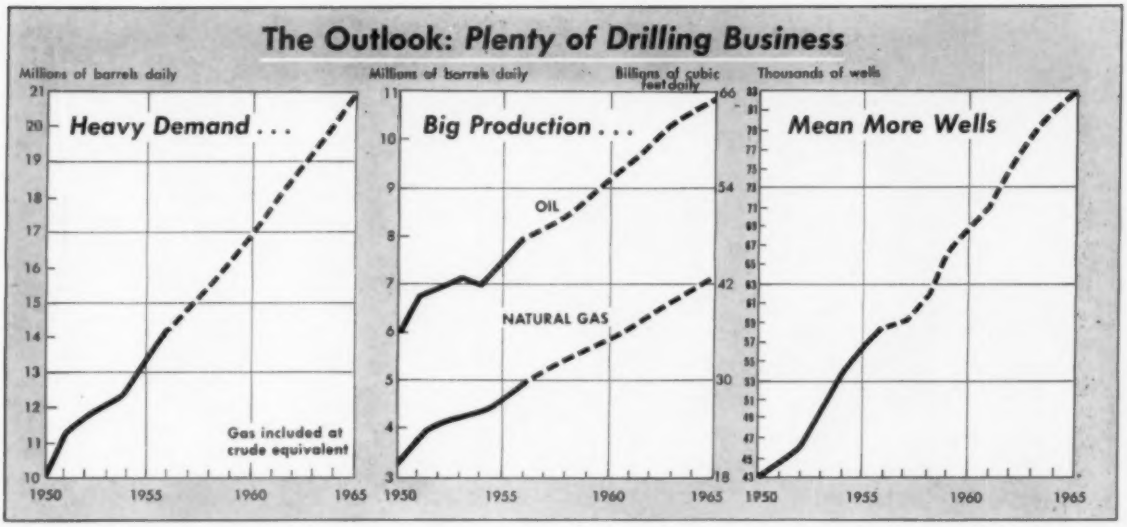
This long-range look at drilling-industry prospects was taken by John C. Casper. As the Journal's economist, he has spent the last 10 years compiling and analyzing statistical information on the oil industry.

Casper's regular forecasts of supply and demand for petroleum products and his projection of drilling operations have become standards for the industry. They often are the basis for management planning.

Casper worked for Sinclair Refining Co. on the East Coast prior to World War II. He took a war-time leave to serve in the research division of Petroleum Administration for War in Washington.

After a short return stint with Sinclair at war's end, Casper returned to Washington with the petroleum economics branch of the Bureau of Mines.

Casper joined the Journal in 1947.



realized in the second quarter, Casper said.

The trend was apparent then when two things happened:

. . . Second-quarter drilling failed to pick up. This is abnormal. Spring usually is a time for revived drilling activity.

. . . Record income from production failed to counteract the slump. Usually drillers can count on high production income to mean stepped-up exploration.

Casper said the answer appears to be this: Low allowables, low crude prices, and high costs disturbed drilling plans by the middle of 1956. Because of the time lag between plans and completions, the downward adjustments did not show up until the first half of 1957.

Early development of the trend was camouflaged by the steel strike. Some economists assumed the slight slump in drilling was due to a shortage of programed drilling for the last half of 1956 based on possibility that pipe would be short.

Explanations lame . . . The Journal economist discounted two popular explanations for the slump. Rush of American money to foreign fields and lack of good drilling locations.

Casper said it is true the surge of leasing outside this country took much of the increased income from higher prices and greater production in the first half of 1957. But, he said, most of this leasing was by larger oil companies. These companies held drilling in this country up to about the same level as the year before.

Talk of a shortage of places to drill is another way of saying we are running out of oil, he noted, adding:

"But ask your geologist. He will tell you that we are on the brink of one of our greatest discovery periods. This time, though, he is hunting strat traps, not structures."

What's the outlook? . . . Several factors will influence drilling in the future. Casper said total completions will be determined by:

. . . Estimates of total oil and gas to be found in this country.

. . . Increases in demand for energy.

. . . Demand for oil and gas.

. . . Split of the market between imports and domestic production.

. . . Relationship between production and reserves.

. . . Changes in amount of oil and gas found per well drilled.

Expected increase in demand for energy assures a future market for oil and gas in this country, This picture is shown by these statistics:

Population growth in this country has averaged 1.44 per cent annually since 1900. Energy consumption has grown at the rate of 2.8 per cent a year. Oil and gas consumption has grown even faster—7 per cent annually—until it now represents 67.5 per cent of the energy fuels used. This rate of growth may slow down in the future, but the volumes involved still will be great.

Domestic demand, for instance, is expected to reach 13½ million barrels daily by 1965 compared with 8¾ million barrels daily in 1956. Demand for natural gas at the same time will go up by 50 per cent to 16.3 trillion cubic feet by 1965.

This market will be split between domestic production and imports. The flow of foreign oil into the United States is expected to level off a little in late 1957 and in 1958. Gains in imports will closely follow gains in demand. They are expected to take a sharper upward turn after 1960, however.

The forecast for 1965 production calls for 20,900,000 bbl. daily of oil and gas compared with 14,159,000 bbl. daily in 1956. The total gain is equal to an average annual gain of 3.8 per cent.

To meet these needs and keep reserves at about 14 times production, the oil industry should have liquid reserves of about 50 billion barrels by the end of 1965. They were a little over 36 billion at the end of 1956. Gas reserves should be expanded to more than 300 trillion cubic feet compared with 238 trillion in 1956.

This means that producers must find and develop about 45 billion barrels of liquids and 184 trillion cubic feet of gas over the next 9 years.

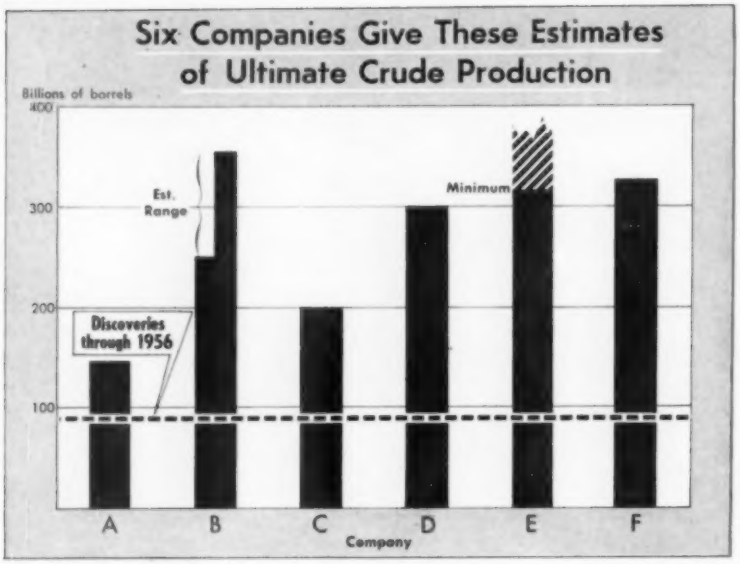
"That will take a lot of drilling," Casper warned the contractors. The industry has produced only 55.2 billion barrels since the Drake discovery in 1859.

The Journal economist took estimates for 1965 to show what the future would hold for drilling contractors. He estimated that about 9.6 billion barrels of new oil and gas would be needed that year. If discoveries and revisions on reserves for that year averaged 116,000 bbl. per well, 82,300 wells would be needed.

This forecast of 82,300 wells would mean 41.5 per cent more wells will be needed in 1965 than in 1956.

Casper noted that if drilling trends shifted to give 119,000 bbl. per well, the industry could get by on about 80,000 wells for the year.

He estimated that 645,000 new



wells would be needed during the next 9 years. That's almost 40 per cent as many wells as have been completed in this country since the Drake discovery.

By using figures from Chase Manhattan Bank, Casper showed how drillers will get 48 per cent more money in 1965 to drill the 41.5 per cent more wells. This forecast was made by Fred G. Coqueron, the bank's petroleum economist.

Coqueron estimated capital expenditures for drilling and production in 1965 will hit $6,625,000,000. This is 48 per cent more than actual expenditures of $4,475,000,000 in 1956.

Frontier in depth . . . The job ahead actually is bigger than the number of wells indicates, Casper said.

"The burden lies in this fact: The holes of the future will not be the same as the holes of the past. They will be deeper."

Casper also declared the time, effort, and money that will go into these deeper wells will be greater.

The challenge will be the deeper formations, he said, and that makes depth the new drilling frontier.

How much oil left? . . . The question of how much oil ultimately will be found in this country has keen interest to any oil company that plans to be in the energy business 25 years from now.

Casper reported he surveyed production economists and engineers with most of the larger companies on this question. Lowest estimate of ultimate production was about 145 billion barrels. Several estimators set possible upper limits of about 500 billion. But the most generally accepted figure on total crude that will be produced in this country is in the range of 300 to 350 billion barrels.

When the amount of crude already discovered is deducted from these estimates, the task ahead becomes clearer. Total crude found at the end of 1956 in this country amounted to 85.6 billion barrels.

Casper then pointed out: "Even if you add only 215 billion barrels in the future, that's 2½ times all of the crude discovered through last year."

American oil men in their search for oil and gas have drilled 1.6 million wells to the end of 1956. However, it won't take 2½ times that many wells to produce the remaining crude in this country since much of future production will come from greater recovery of crude from known and to-be-discovered reservoirs.

The figures do give an idea of the great amount of drilling that will be required in coming years.

Tekoil Buys More Property

DALLAS. — Tekoil Corp., which went on a property-buying spree last June, has boosted its oil reserves by another 2,000,000 bbl. and gas reserves by 12,000,000 M.c.f.

The firm has acquired working interests in 72 oil wells and 11,500 acres of nonproducing leases and royalties in Kansas and Oklahoma, from Gerald L. Schlessman, Denver, and others. Since June, Tekoil purchases have included interests in 216 wells, boosting oil reserves by more than 4,000,000 bbl., and increasing gas reserves by 44,000,000 M.c.f.

Washington's No. 2

Shallower sand pays off for offset to 1 Medina

SUNSHINE MINING CO. has scored again in Washington—this time with an offset to its discovery well, 1 Medina, but in a shallower sand.

The latest success, 2 Medina, is located 840 ft. northwest of the discovery in the Ocean City area of Grays Harbor.

On a drill-stem test of a shallow interval at 2,590-2,602 ft. on 2 Medina, the operator reported gas surfaced in 1½ minutes and oil in 50 minutes with a moderately strong blow estimated at 400 M.c.f. Recovery was rated at about 75 bbl. daily of 46.8°-gravity crude.

The well is located 180 ft. west and 600 ft. north of 1 Medina and is programed to take a look at the productive Nye (Miocene) sand found in 1 Medina at 3,952-58 ft.

The 2 Medina also turned up a 15-ft. sand and shale section at 3,314-29 ft. which had a slight oil odor. No tests are planned for this section.

In finding pay 1,350 ft. higher, Sunshine may have discovered a two-sand field. It is known the field is faulted, and this may have some influence on the sand succession.

Meanwhile, 1 Medina has been on continuous production since September 25 and is currently making 70 bbl. daily through an 8/64-in. choke. The crude is shipped to U. S. Oil & Refining Co.'s refinery in Tacoma via tank car and tank truck. The 1 Medina is the first commercial well in the state of Washington.

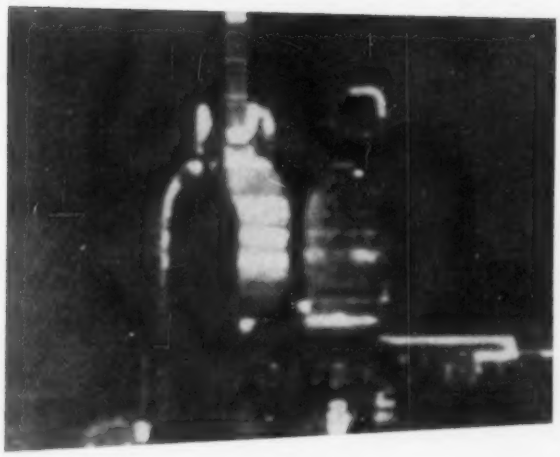
Alaskan Operations Pooled

SAN FRANCISCO.—Richfield Oil Corp. is turning over its role as operator on the Kenai Peninsula of Alaska to Standard Oil Co. of California, Western Operations, Inc.

The companies have pooled their extensive land holdings in the area and Socal has agreed to spend $30,000,000 over the next few years on a joint exploration and development program there.

Included in the acreage is the 71,680-acre Swanson River Unit where Richfield recently completed Alaska's first major discovery (OGJ, Oct. 7, p. 112). The Swanson unit is held 89 per cent by Richfield. The remainder is divided equally between Union Oil Co. and Ohio Oil Co. A road to a second drill site 2 miles south of the discovery is being prepared.

This cat cracker looks fine until . . .



Faulty insulation shows up when . . .

Heat Camera Tattles on Refinery Hot Spots

THE WRAPS are off a new temperature measurement tool which takes heat pictures.

With military declassification of this new technique, Barnes Engineering Co. of Stamford, Conn., is demonstrating a thermal camera to industry with the object of expanding its use outside the military.

The new device, called a Barnes Far Infrared camera, photographs the infrared radiation given off by all surfaces within range of the camera. Heat emission is scanned by a moving mirror and precisely measured by a Barnes optitherm radiometer system. This ultrasensitive heat detector in turn modulates the brightness of a beam of light which is reflected from the back of the scanning mirror, and scans an ordinary photographic film. The result is a black-and-white picture which shows the hottest spots in the camera's range as white, the coolest as black, with intermediate points shown in degrees of grayness.

Sensitivity of the device can be adjusted to measure wide ranges of heat emission or fine differences of less than 0.04° F. Blood vessels in a man's arm can be pictured by the slight warming of the skin area immediately overlying them.

Industrial uses are just now beginning to be investigated. In refineries, a picture of a process unit will show hot spots on the unit's surface.

An infrared aerial reconnaissance camera has been developed, but details cannot be revealed at this time. Probably, the first application in the petroleum industry will be through service companies. Barnes anticipates industrial uses will far outstrip military uses.

Offshore and secondary-recovery oil is why . . .

. . . California Production Will Swing Up

LOS ANGELES. — California's steadily declining production will take an upswing in the next 5 to 7 years.

The state's peak production should be 380 million barrels annually sometime around 1963 to 1965.

This prediction was made last week by P. G. Cook, Union Oil Co. engineer, in a paper delivered to the southern California petroleum section of the A.I.M.E.

Cook based his prediction on three developments between now and 1963-65:

. . . **Secondary recovery** will reach a productive peak of 60 million barrels annually.

. . . **Offshore production** will reach about 10 million barrels yearly.

. . . **Primary production** will decline to about 310 million barrels annually.

Cook said production from tar sands will come into its own in the decade after 1965 and help to keep California's production above the 300-million-barrel mark.

Different peaks . . . California's sources of crude won't reach their production crests at the same time, Cook said.

The picture for each looks like this:

. . . **Primary onshore** recovery will continue its steady decline which started in 1953.

. . . **Secondary recovery** onshore will grow and probably peak at 60,000,000 bbl. annually in the mid-1960's.

. . . **Offshore primary** production, with an estimated reserve of 3.5 billion barrels, will probably peak at 160,000,000 bbl. annually.

. . . **Offshore secondary** recovery won't start until the offshore primary productive peak is reached and will amount to about 14 per cent of the primary production in volume and rate.

. . . **Tar-sand production** will start about 1965 and will peak at 15,000,000 bbl. annually. California's tar sand reserves are estimated at 200,000,000 bbl.

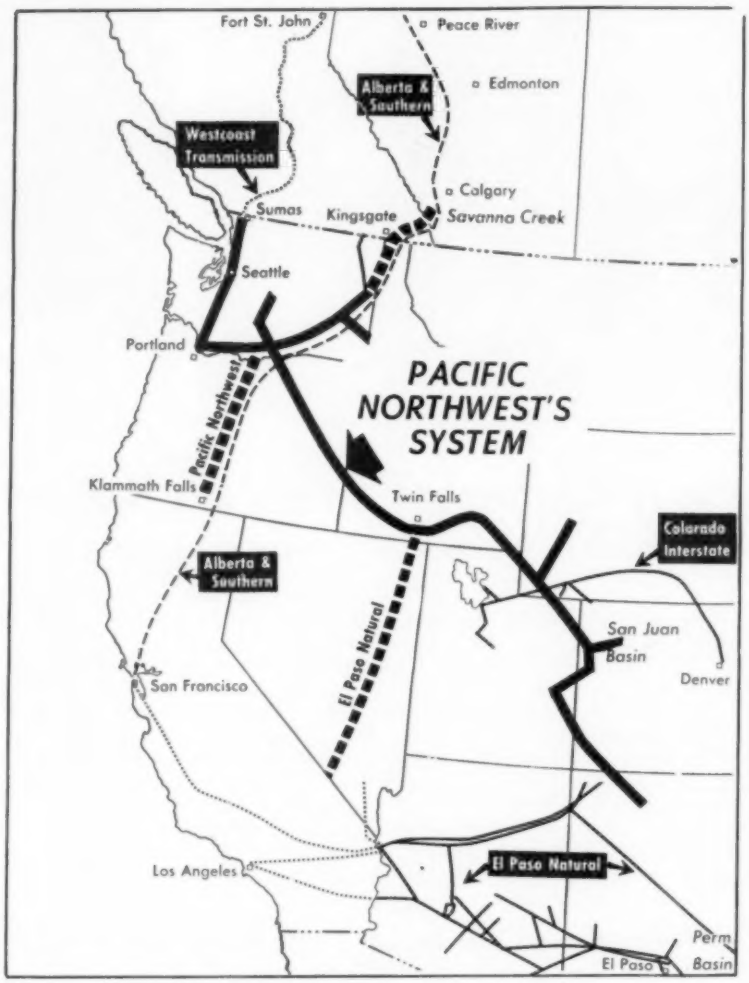
Summarizing, Cook predicted secondary recovery onshore and primary recovery offshore will hold the state's production at a steady rate for a short time.

Gas at both ends, markets all along mean:

Pacific Northwest Lines Sure to Grow

- Whether the merger with El Paso is upheld or voided, this huge gas system will expand rapidly

- Canadian gas, just now starting to flow, will have a major role in the future of the western U.S.



PACIFIC Northwest Pipeline Corp. is on its way to becoming one of the nation's largest transporters of natural gas.

Its growth is assured for two reasons:

. . . A gas supply which is one of the most important found in the Western Hemisphere in recent years.

. . . An untapped market in the fastest-growing area of the United States.

A key development in the program occurred this month when the first Canadian gas crossed the international border at Sumas, Wash. This small flow promises to rise to a flood within a few years. It will provide more than half the volume carried by the system, a matter of major importance for the western United States.

Expansion plans will be pushed regardless of the outcome of the government suit to dissolve the merger of Pacific with El Paso Natural Gas Co. Both firms are stronger under unified operation. But the suit poses no threat to their future. Continued cooperation is dictated under long-term contracts and location of the companies' facilities.

Expansion plans . . . Pacific's outlook is bolstered by this prospect: If projects now on paper are approved, the volume of gas handled by the company will triple by 1960.

Pacific by 1960 will be transmitting 1,250,000 M.c.f. daily. It has been pumping 300,000 to 400,000 M.c.f. daily through its 1,466-mile, 22 and 26-in. system from Ignacio, Colo., to Sumas, on the Canadian border. The first year the system carried only Rocky Mountain gas, primarily from the San Juan basin.

During November and December, volume will jump sharply with Canadian gas entering the line from the north at Sumas. Contracts call for a maximum of 200,000 M.c.f. daily from Westcoast Transmission Co., Ltd., during these 2 months. Pacific must take or pay for 90 per cent of the maximum, or 180,000 M.c.f. daily.

Starting January 1, the maximum increases to 250,000 M.c.f. daily, with the same 90 per cent take-or-pay clause. By 1960, Pacific plans to be importing 650,000 M.c.f. daily from Westcoast.

Pacific's system capacity will be 650,000 M.c.f. daily in 1958, almost double the 1957 capacity with very little added capital spending. Deliveries then are expected to average 550,000 M.c.f. daily. With this high load factor, made possible by moving gas from both ends, the system will begin to realize its real earnings potential. Originally a small-diameter line was planned for the northern end, since volume at first would be small. But by making this section 26-in., through spending an extra $20 million, potential capacity was doubled.

As one company official put it: "We paid through the nose the first year, but down the road we'll have the sweetest system in the country, with gas at both ends and in the middle."

Market growth . . . Early operations have been based primarily on big industrial loads in the Rockies and Pacific Northwest.

Some 60 per cent of the first-year load was industrial, in sharp contrast to most systems which are based on home heating and commercial uses.

But as the system grows, the load balance will shift the other way. The big industrial customers, being the easiest means to a quick substantial load, were signed up first. Pacific and connected utilities are supplying aluminum, airplane, sugar, smelting, cement, uranium, vanadium, fertilizer, pulp paper, and other types of plants.

One is Phillips Pacific Chemical Co., at Kennewick, Wash., which Pacific owns with Phillips Chemical Co. The plant produces ammonium nitrate from natural gas feed stock.

Now growth will be geared to development of the space-heating market served by utility customers. The major ones are Portland Gas & Coke Co., Washington Natural Gas Co., Cascade Natural Gas Corp., Intermountain Gas Co., Colorado Interstate Gas Co., and Mountain Fuel Supply Co.

They operate in Colorado, Utah, Idaho, Wyoming, Oregon, and Washington. This market started slowly because natural gas was new to the area. Every new connection meant conversion from another fuel — propane, fuel oil, coal, or manufactured gas. Fuel oil is being displaced in most cases.

The biggest single potential market is the Seattle-Olympia-Tacoma area, served by Washington Natural. Only 30 per cent of Seattle has natural gas.

New projects . . . But the Pacific Northwest and the Rockies are not the only markets eyed by Pacific.

Other projects — approved, before the Federal Power Commission, or planned—would bring gas from the Pacific system through connecting pipelines to Chicago and California.

Pending before FPC is a proposal, approved by an examiner, for Pacific to increase by 100,000 M.c.f. daily the 117,500 M.c.f. sale to Colorado Interstate, its largest customer, for the Beatrice project. This is part of a plan by which Colorado Interstate would supply Natural Gas Pipeline Co. of America with 460,000 M.c.f. daily from Kansas, Texas, Oklahoma, and the Rockies for the Chicago market.

On January 1, Pacific has a contract to start selling 50,000 M.c.f. daily to El Paso, which now is the sole out-of-state supplier for California. A year later this volume is due to double. Sales to El Paso will increase far beyond these projected figures if a recently announced project goes through.

This is a plan to import gas from Westcoast at Kingsgate, B. C., where Pacific will build a line to meet Westcoast's 30-in. line planned from Savanna Creek field in southern Alberta. Westcoast has already signed contracts for reserves in this field.

Pacific would deliver to El Paso at Twin Falls, Idaho, from which point El Paso would build a 550-mile, 34-in. line southward through Nevada to the California border near Las Vegas. El Paso has contracted to sell Southern California Gas Co. and Southern Counties Gas Co. 100,000 M.c.f. per day through this line starting September 1, 1959, and 200,000 M.c.f. per day a year later. Ultimately 600,000 M.c.f. daily would be imported through this system.

Pacific and P.G.&E. . . . A long dormant Pacific project could be revived quickly by plans of another company to import Canadian gas into California.

This is a 280-mile, 26-in. line from near Goldendale, Wash., on the Pacific system, to the California border, near Klammath Falls, Ore. The Goldendale line could be Pacific and El Paso's answer to Pacific Gas & Electric Co., San Francisco utility which is behind the proposed line from Alberta. P.G.&E. is El Paso's biggest customer.

P.G.&E. has organized Alberta & Southern Transmission Co., Ltd., to build a 1,300-mile, 30 to 36-in. line from northern Alberta to the San Francisco area.

None of these projects has been placed before the FPC. But the Twin Falls and San Francisco applications will have to be filed soon if contracts and announced plans are carried out. And the Goldendale line, which has remained in the background up to now, may well be the alternative offered to the FPC when P.G.&E. seeks approval for its line from Canada.

It is Pacific's position that California and the public interest can best be served by expansion of existing facilities — namely those of Pacific, Westcoast, and El Paso. This affiliated group cannot be expected to hold still while a large portion of the future market it had counted on goes to another pipeline.

Which pipeline? . . . El Paso and Pacific may have at least an initial advantage in this tussle.

In the first place, they are already set up to import gas from Canada. Their supplier, Westcoast, has a federal charter—not an easy document to obtain—is already operating, and has access to the reserves needed. Westcoast is owned primarily by Canadians, which is no small point when Canadians are pressing for a larger share in management and ownership of their oil and gas industries.

P.G.&E. has recognized this fact in taking Canadians into Alberta & Southern Transmission. The new company has seven Canadians and six Americans on the board.

No one questions the soundness or feasibility of either project. The market is there, and so is the gas. Financing should be no problem. It will be up to the FPC to decide which is in the public interest.

One thing appears certain, however. Regardless of who builds the line, Canadian gas is destined for a major role in the supply picture of western United States. It will become a factor in the Midwest and New York, too, under plans of Tennessee Gas to import from Trans-Canada.

The only limiting factor at this time would seem to be how much gas Canada feels it can safely release for export without jeopardizing supplies for its own needs. But the presently limited Canadian market, the large uncommitted reserves, and the benefits to Canada in early development of its resources, indicate that these projects are not the place to draw the line.

Indeed, if development continues as expected, reserves may be adequate to supply Canada, and a large export market as well, for years to come.

At a record price:

Pacific Northwest Adds Colorado Gas

PACIFIC NORTHWEST Pipeline Corp. has contracted for a large gas reserve at what is believed to be a record price for the Rocky Mountains.

Pacific will pay 16 cents an M.c.f. at the wellhead in the Southeast Rangely gas area, in Rio Blanco County, Colorado, if deliveries are made to the nearby main line at 860 psi. This is 1 cent above the going price. If the pressure requirement is not met, the price will start at 15 cents. There will be a 1-cent escalation every 5 years.

The contract was made with Vanson Production Corp. and its officials; G. E. Kadane & Sons, Wichita Falls, Tex.; Phillips Petroleum Co.; and Gulf Oil Corp., which own one-quarter undivided interests in the 6,000-acre block on which the discovery was drilled. The 1 Moran was brought in during July 1956 at a potential of 10,000 M.c.f. per day on a ⅜-in. top and ¼-in. bottom choke.

The deal is for at least 100 billion cubic feet of gas on a unit block of 14,000 acres. Pacific has an option to buy additional reserves as they are developed.

Oklahoma Crude Line for Sale

. . . but no one is making it official yet. Gulf reported ready to quit gathering, blasts state allowable policies

AT LEAST one major oil company is ready to sell its crude gathering system in Oklahoma. And there may be others ready to do the same thing.

Gulf Oil Corp., while not saying so officially, has been approached by prospective buyers. The Texas Co. also is reported willing to get rid of its lines.

So far, however, no one has made a firm statement that its system is on the auction block. And negotiations apparently are stymied because of it.

The reports that Gulf is preparing to pull out of the crude-buying business in Oklahoma came at a time when Gulf is warring with the Oklahoma Corporation Commission.

The commission has cited Gulf for contempt for refusing to take its full crude-oil allowable from Oklahoma leases. Hearing is set for November 27 and 29.

Gulf's position . . . Gulf has been tight-lipped on plants to sell its extensive gathering lines in the state but has not hesitated to blast the commission for the contempt citation.

"The position of this company is that the corporation commission, by its mandatory purchase order, usurped a power not granted to it by the laws of Oklahoma and denied to it by the Constitution of the United States," Gulf says.

The company contends it cannot "use, sell, or store" the amount of oil fixed in the allowable and that "the whole question is whether oil should be processed in excess of demand."

Whether Gulf's unannounced plan to sell its gathering lines has any connection with the contempt citation is not known.

Ray C. Jones, chairman of the commission, took the position that the two matters are not related.

"Gulf has been wanting to sell its lines for a long time, anyway," Jones said. "That's nothing new."

Jones also contended that the commission has made no mandatory order on crude purchases. The order, he said, required only that Gulf apply to the commission for relief if it could not take the full allowable. Other companies have applied for, and received, relief.

Gulf's answer to the order was to continue pipeline proration and file a lawsuit in federal court. It made no application to the commission. The U. S. Supreme Court refused to hear the case and said Gulf had not exhausted its remedies in the Oklahoma courts. Gulf then sat tight and prorated again during August.

The commission finally took action and issued a citation for contempt and, with it, a threat of $5,000 fine for every violation — which could number into the thousands.

Buyers available . . . If Gulf wants to get rid of its gathering system in Oklahoma, there are several companies in the market for new lines. Among them are Kerr-McGee Oil Industries, Inc., Mid-Continent Pipe Line Co. (Sunray Mid-Continent), and Rock Island Oil & Refining Co.

At least one, and perhaps all three, has been in contact not only with Gulf but with other pipeline system owners who want to get out of the gathering business.

But, as one prospective purchaser put it: "We haven't got them on the line. I feel like something will jell one of these days. But then, again, it may not be for a year, or ever."

One deterrent to profitable sale of pipeline gathering systems is the simple fact that interested buyers are worried about what they would do with the excess crude suddenly on their hands. The high allowables that brought on pipeline proration are still in force.

"That's the trouble—what to do with the crude," said one pipeline man.

Displays tell story of Louisiana oil as:

Gulf Coast Show Makes a Hit

LAFAYETTE, La. — The second biennial Louisiana Gulf Coast Oil Exposition got Oil Progress Week off to a big start here. Blessed with good weather, exhibitors showed $2,867,000 worth of equipment to big crowds in Lafayette's Blackham Coliseum.

There was no exact attendance count, but it was a much bigger show than that of 2 years ago. There were 196 exhibitors this year compared to the 122 who displayed equipment at the first shows 2 years back.

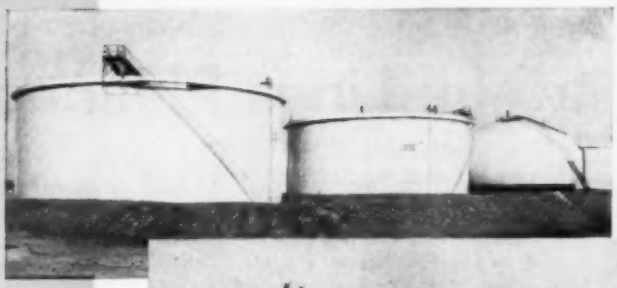
The difficulty of getting about in South Louisiana was apparent from the great amount of transportation equipment on exhibit. There were airplanes and helicopters for hauling personnel, and big trucks for moving the heavy rigs typical of the area.

There was no doubt that South Louisiana is the home of the deep, high-pressure well. There were high-pressure blowout preventers and automatic accumulators for operating them. There were several firms showing centrifuges, desanders, degassers, mixers, and other mechanical equipment for treating the expensive, heavyweight muds of the region.

Presence of several directional-drilling companies pointed up the frequency with which wells onshore and offshore of Louisiana are whipstocked.

77

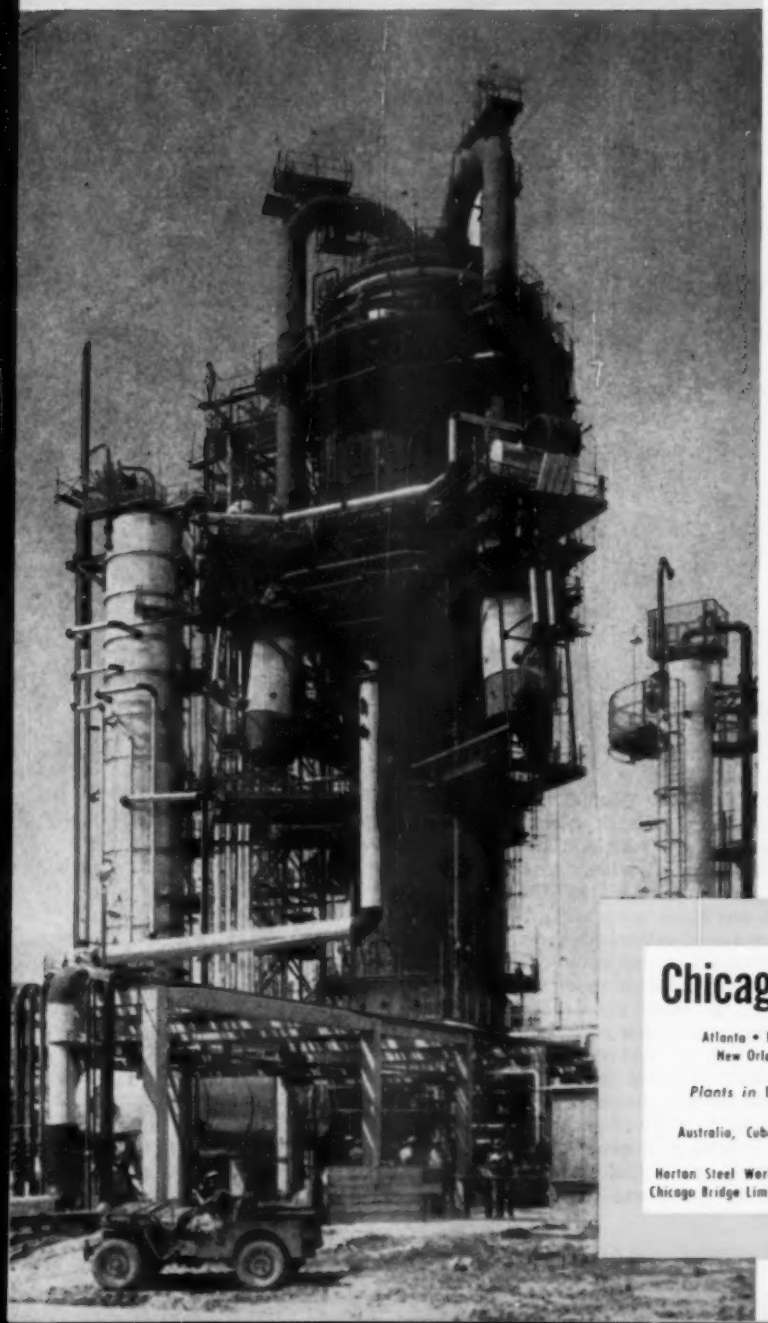
CB&I Structures serve AMERICAN OIL COMPANY at Yorktown, Virginia



Some of the 77 CB&I-built storage and processing structures at American Oil Company's Yorktown refinery include:

Top: Two of 34 Horton® Pontoon Floating Roof tanks, and a 40,000-barrel Hortonspheroid®.

Bottom: 10,000-barrel Hortonspheres®, designed for 75 pounds per square inch butane storage.



When American Oil Company's Orthoflow Fluid Catalytic Cracking unit went on stream in 1956 at their new 35,000-bbl. per day Yorktown, Virginia refinery, it contained a reactor, regenerator, vacuum tower, crude tower, absorber tower and catalyst hoppers fabricated by CB&I and furnished through M. W. Kellogg Company. Extensive storage facilities including 34 Horton® Pontoon Floating Roof Tanks, 28 Horton Cone Roof Tanks, Hortonspheres® and Hortonspheroids® have brought Yorktown's total of CB&I storage and processing structures to 77.

The same CB&I extensive design, fabrication and erection services that have served American Oil Company are available to you. Whether you're expanding, or building new . . . see CB&I.

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P60CB

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55-In. Lines Planned

Twin monsters will be built by Carnegie Natural; system will move coke-oven gas at low pressure to six plants

A PAIR of king-size pipelines will be built by Carnegie Natural Gas Co., a subsidiary of U. S. Steel Corp., to provide coke-oven gas to six Pittsburgh area plants.

The two parallel lines will have an outside diameter of 55⅜ in. for the first 8½ miles of their 13-mile length. The remaining 4½ miles will be of 43¼-in. pipe.

Carnegie is investing $15 million in the dual-line system to transport 255,000 M.c.f. per day of byproduct coke-oven gas to plant furnaces. The line will originate at a compressor station at the Clairton Works and end at the Homestead Works.

Williams Brothers Co., Tulsa, has a turnkey contract for the project. Engineering work is being completed this month. Supports and towers are being erected for the lines, which will be laid aboveground for about two-thirds of their length. Pipe laying will start next May and be completed the following November.

The 55⅜-in. diameter is one of the largest, if not the largest, ever used for a gas line, although steel pipe up to 80-in. has been used for water lines for the Army. American Bridge Division of U. S. Steel is making new rolls to fabricate the gas line pipe. The 55⅜-in. size will have ⅞-in. wall and the smaller size ⅜-in.

Some problems . . . Special hydraulic lineup clamps, internal and external, have been developed to use in construction.

A specially built scraper—the largest ever made—will be run to keep the lines free of tars and resins which will settle out of the dirty, wet gas. No internal corrosion is expected from the deposits, but without scraping they would soon lower flow efficiency.

Water condensation was another problem for designers. The gas has a dew point of 110° F. Forty-three drips were installed to catch condensation.

Gas will enter the lines at 250° F. To protect against heat and the caustic effect of steam coming off a quench bath for ingots, the lines will be coated with an epoxy coal tar for the first 700 ft. Steel supports will be coated with concrete in this hazardous area.

The jagged profile and congested areas crossed posed both design and construction headaches. The entire route is in industrial and suburban districts. One railroad yard is crossed by a 360-ft. suspension bridge 35 ft. high. The lines follow the Monongahela River part of the way.

Low-pressure system . . . A bank of 11 compressors at Clairton will pump gas into the line at 15 psig.

The large diameter and low-pressure operation was chosen as the most economical in spite of the much larger investment for steel. The same volume of gas could be handled, of course, in a 20 or 24-in. line at high pressures. But a high-pressure line would have required extensive treating facilities to clean the gas before compression.

Studies proved the low-pressure system would have better amortization and lower operating costs.

By adding horsepower, the system can transport increased volumes up to 20 psig. discharge pressure.

FPC Order Tested

C.A.T.C. price to T.G.T. is challenged by New York

WASHINGTON.—The right of the Federal Power Commission to change its mind will be tested in the courts.

The direct question: Was the FPC's June 24 order allowing a price of 22.4 cents per 1,000 cu. ft. for offshore gas sold to Tennessee Gas Transmission Co. by the C.A.T.C. group an "unwarranted" reversal of a previous order setting the rate at 18 cents?

The New York State Public Service Commission raised the issue. It has asked the Third Circuit Court of Appeals to review the order, the FPC was advised last week.

The C.A.T.C. group (Continental, Atlantic, Tidewater, and Cities Service) contracted to sell several trillion cubic feet of gas to Tennessee over a 20-year period. It asked the FPC to approve an initial price of 21.4 cents plus a 1-cent gathering charge.

An FPC examiner approved the deal. But the commission ordered a 4-cent cut in the price. The producers refused to accept that ruling and threatened to call the deal off, whereupon the FPC reversed itself. The FPC said the need to assure the public that this great supply of gas would be made available was more important than the precise initial charge.

If the initial price was too high, the agency said, it could be corrected by an investigation of its reasonableness. That investigation is now under way.

A 107-mile pipeline to bring the gas to shore is now being completed for T.G.T. Deliveries under the contract are scheduled to start November 1.

Wage Trend Likely

Canadian refinery strike may set pattern for '58

VANCOUVER, B.C.—Labor's dispute with Imperial Oil, Ltd., may set the pattern for 1958 pay increases for Canadian oil workers.

Imperial's 25,000-bbl. refinery at nearby Ioco has been shut down since September 24 when 250 workers walked off their jobs. A settlement of the strike was expected soon.

The strike came after 14 months of negotiations between Imperial and the Oil, Chemical, and Atomic Workers International Union. The wrangle is over a 12½ per cent wage-increase demand and other issues.

The Ioco union is the only O.C.A.W. group of Imperial workers, although Imperial has 14,000 employes in Canada. Imperial is an affiliate of Standard Oil Co. (N.J.).

The union said the strike began after the company rejected recommendations of the British Columbia Conciliation Board which favored 8 out of 16 O.C.A.W. demands. Strike action was approved by 89.2 per cent of the membership in government-supervised balloting.

Besides wages, the issues involve full company payment for an existing medical plan, retroactivity, category adjustments and reclassifications, double time for overtime work, and withdrawal of certain company proposals having to do with seniority.

"Out of this dispute there may very well develop our wage pattern in the petroleum industry for 1958," said Neil Reimer, director of that district for the Canadian O.C.A.W. The 1957 wage increases granted in Canada last spring averaged 7½ per cent.

Clark Plans Big Expansion

CHICAGO.—A three-prong expansion program by Clark Oil & Refining Corp. will mean greater refining capacity, access to a deep-water products terminal, and a first step toward drilling activity.

The company will increase its Blue Island refining capacity from 21,000 to 30,000 bbl. daily in a $7,200,000 construction program. New units will

produce 30 per cent more gasoline than is now possible with present facilities.

A 15-mile, 8-in. pipeline will carry products to a deep-water tanker terminal at Indiana Harbor. Clark has acquired a 20-acre tract and will build terminal facilities to hold about 220,000 bbl. of storage. Refining and pipeline projects will be completed next spring.

The company has already established a new division for exploration and production at Denver. A research program is under way, but drilling activity will not start until 1959.

Pump Blend Grows

Sun now invades northeast with six gasoline grades

SUN OIL CO. is betting it has a marketing winner in its revolutionary custom blending at the pump. Sun's new-style pumps which make the practice possible are invading the northeast for the first time.

The Sun pumps originally were tested in Florida. The first one in the East appeared this week at a service station in Rosemont, Pa. It is a redesigned type capable of dispensing six grades of gasoline, ranging from 94 to 102 octane. Earlier pumps in Florida only blended five grades.

Grades offered in the East are Blue Sunoco 200, 210, 220, 230, 240, and 260. Octane value of 200 is Sun's currently standard 94. Each succeeding grade will be about 1½ octane numbers higher, except for 260. It will be about 102 octane.

The grades are expected to retail at a 1-cent differential from 200 to 240. The top grade 260 will retail at 6 cents above 200.

The Rosemont installation will be the first of 50 such units to be installed in the Malvern marketing district. Malvern is a suburban area just west of Philadelphia. It is bounded roughly by the towns of Coatesville on the west, Westchester on the south, Pottstown on the north, and the Philadelphia city line on the east.

After the first of the year, installation of the new pumps will be made throughout the rest of Sun's 19-state marketing territory. No one territory is to be favored. It will take the first 5 or 6 months of 1958 to complete the job.

Sun has 8,500 dealers in the United States and Canada, and all will eventually have the units. Sun has ordered 10,000 pumps. Only about 1,500 high-volume stations will get more than one. Tankage to handle the high-octane concentrate has to be installed in addition to the pump.

watching WASHINGTON

. . . with Bertram F. Linz

West Coast import pot boils . . .

GOVERNMENT-IMPOSED crude import controls may hit the West Coast industry after the turn of the year.

Area producers came to Washington early this month with a plea for a cutback in imports. But there already were signs that the cabinet committee had the matter in mind and would take action within the next few weeks.

A change in the supply situation west of the Rocky Mountains is foreseen by the committee when the new Four Corners pipeline goes into operation. And it also has been found that imports are beginning to top the 275,000-bbl. daily level expected last July.

If limits are placed on West Coast imports and if producers go along with the program, a lot of the urgency for a quota law will be taken out of the debate on extension of the Reciprocal Trade Act next year.

A year-end review of the West Coast situation was promised by the cabinet committee in its report laying down the new import rules. The western importers will shortly be asked to submit their plans for the first half of 1958. The committee will then decide what the proper level should be.

Imports into the area probably will be cut back to make room for oil coming in through the Four Corners line. But they are not likely to be reduced as sharply as the domestic producers would like.

O'Mahoney gets cold shoulder . . .

SENATOR O'MAHONEY'S demands for action against companies taking part in the European oil lift last winter do not impress the Justice Department.

Atty. Gen. Herbert Brownell's report on the Interstate Oil Compact noted acidly that the details "have been extensively reviewed and reported." And he made it clear he felt his department's surveillance kept everybody honest. His views have been made known to the senator.

O'Mahoney isn't the type to take rejection of his ideas quietly. He will let that be known at a time of his choosing. And he may make Brownell do a lot of letter writing this winter.

Congress and the microscope . . .

OIL-INDUSTRY PRICING will get a two-way going over in Congress next year.

Sen. Estes Kefauver of Tennessee is resuming his probe of so-called administered prices—prices allegedly set with little or no regard to supply and demand. So far the inquiry has been limited to steel. But next session it will be extended to take in other industries. Oil is high on the list.

Meanwhile, the joint congressional economic committee is getting into the picture with plans for a broad study of prices and their effect on the economy. Purpose of this probe is to find ways by which public and private policies can contribute most to maximum employment, production, and purchasing power.

Congress has long been concerned over the steady rise of prices. With an election coming up, members fond of their jobs would like to have something concrete to offer voters in the way of inflation control.

Oil prices will be much in the news in months to come. The Justice Department has filed a suit in the Midwest based on a gasoline price war in the South Bend, Ind., area. The federal grand jury at Alexandria, Va., is expected to report on industry pricing policies this winter.

Another grand jury is getting under way in Washington with a study of heating oil prices. And the Federal Trade Commission has filed a complaint against selective price cutting by The Texas Co. in the Norfolk, Va., area.

DEVICE for accurately measuring offshore distances is inspected by F. T. (Billy) Glascock, Collins Construction Co. general manager. Lightweight, easy to handle . . .

Portable Radar Does an Oil Job

PORT LAVACA, Tex. — Collins Construction Co. has acquired super-sensitive radar devices for use in offshore surveys.

The company, specializing in submarine pipeline construction, claims the system measures distances up to 50 miles with a probable error of less than 1 ft.

The system is known as the Tellurometer. It is an outgrowth of years of research and development by South African Council for Scientific and Industrial Research. Collins says only four of the units have been distributed in the United States, and Collins is the first construction firm in this country to purchase one.

A refinement of radar is used by the Tellurometer to measure distances. The system uses one master unit and two remote units. It operates in the 10-cm. wave length region and measures the travel time of radio waves over the length to be determined with an accuracy to within less than a millionth of a second.

The instruments are light, portable, and easily erected. The entire instrument pack weighs 57 lb. Operating at any distance from 500 ft. to 40 or 50 miles, the Tellurometer can be unpacked, set up, and making desired measurements in less than 30 minutes.

Only one master station and one remote station are needed to measure a single line. However, in offshore work, a trilateration system is used, with two remote stations set up at known positions on shore and the master station mounted on a floating vessel.

The seaward location is determined by measuring the distance to each remote station and plotting the point where the two measured lines intersect.

Measurements can be made either in daylight or darkness since visibility is not required.

Collins has two complete systems, consisting of six instruments, for use in determining overwater distances in hydrographic surveys and submarine pipeline projects.

Pipeline Plan Revived

WASHINGTON.—West Coast Pipeline Co. has renewed its efforts for Government aid to build a crude line from West Texas to Los Angeles.

West Coast, whose previous applications have been denied, filed a new appeal with the Office of Defense Mobilization.

The new appeal made these points: California's crude deficit, made up in peacetime by imports, would result in a desperate shortage in event of war. National security thus dictates government help in getting a line from West Texas and New Mexico into California. These crude-producing areas are the logical sources for oil to fill California's needs.

Transco Expands

● Stepped-up building program will cost gas carrier $139 million

HOUSTON.—Transcontinental Gas Pipe Line Corp. last week announced plans for a stepped-up expansion program costing an estimated $139 million:

The proposal would provide:

. . . **Development** in conjunction with other companies of new storage facilities in Pennsylvania to make available an additional 200,000,000 cu. ft. of gas per day to Transco customers during the winter heating season.

. . . **Facilities** in South Louisiana "to tap large offshore gas reserves in the Gulf of Mexico."

. . . **Additional** construction on Transco's main line, virtually completing the looping program for its entire length.

. . . **Increased** daily allocated capacity of the Transco system by 175,000,000 cu. ft. to a total of 1,145,000,000 cu. ft., exclusive of gas in storage.

Increased deliveries from Pennsylvania storage fields are expected to be available for the 1959-60 heating season. Present storage supplies peak-day deliveries of about 136,000,000 cu. ft. to Transco customers along the eastrn seaboard.

Present construction . . . Transco currently has an extensive program of expansion under way. When completed it will boost the system's gas capacity to about 970,000,000 cu. ft. per day, exclusive of gas from storage.

The company announced it has let contract for a major segment of its pipeline laterals to take gas from shut-in fields in south central Texas. Panama-Williams Corp. has the contract to lay 129 miles of 24-in. line from Transco's compressor station near El Campo, Tex., to the Ike West meter station near Three Rivers, Tex.

Clearing and grading work had started last week. Panama-Williams expects to start laying pipe this week. Completion target is January 20, 1958.

H. B. Zachry Co. is constructing other segments of the Transco laterals (OGJ, Oct. 7, p. 119). When completed, the expansion will make available to Transco large gas reserves in Frio, McMullen, and LaSalle counties.

Transco's main line extends from South Texas to New York City. With completion of the 1957 construction program about 77 per cent of the line will be looped.

Offshore Truce Pays Off: Output Averages 42,000 Bbl. Per Day

NEW ORLEANS. — Since drilling resumed in Louisiana's disputed tidelands just 1 year ago, the oil industry has chalked up a remarkable record for the hotly contested area.

Production of crude oil and condensate totaled more than 13,600,000 bbl. from October 1956 through August 1957. Natural-gas production for that period was 86,000,000 M.c.f. Nine new pools were discovered.

Drilling activity in the disputed area off Louisiana's coast was resumed last October 12—4 months after the U. S. Supreme Court halted oil development until it could decide whether Louisiana or the U. S. Government owns the oil-rich tidelands.

But the Supreme Court left the door open for an interim agreement between the state and the federal Government. This agreement revived drilling in a belt which in places extends 30 miles wide.

The case is still pending before the Supreme Court. Louisiana claims ownership of a minimum of 3 marine leagues (10½ miles) seaward and the U. S. contends Louisiana owns only 3 miles.

Money accruing to the owner or owners of the tidelands, as a result of the drilling activity, is being impounded until the case is decided. Since the interim agreement of last October, the federal Government has impounded $85,052,460, and Louisiana has impounded an additional $25,464.

In the 1-year period, operators have drilled 248 wells, including 146 oil wells, 35 gas wells, and 67 dry holes. More than 130 wells are being drilled.

Pipeline Calls Off Merger

SALT LAKE CITY, Utah.—Northwest Production Co. has abandoned negotiations to merge with Western States Refining Co. of Salt Lake City.

Northwest Production, subsidiary of Pacific Northwest Pipeline Corp., had planned a 10-in. crude and products line from the Four Corners area to Western States' refinery in Salt Lake City.

However, C. L. Perkins of El Paso, Tex., president of Northwest Production, said plans for the merger and the pipeline have been dropped. He added that his firm is studying the possibility of building a crude and products pipeline through "other means."

Processing briefs

Corpus Christi - Howell Refining Co., San Antonio, has put back on stream a Corpus Christi refinery which had been shut down nearly 20 months. The plant, formerly operated by Corpus Christi Refining Co., has a capacity of about 8,000 bbl. per day. It is now processing about 5,000 bbl. daily of Gulf Coast crude and is making jet fuel in addition to other products. Howell acquired the plant from Jack Blanton, trustee, Houston.

Odessa Butadiene Co. and General Tire & Rubber Co. last week dedicated the country's first privately financed, completely integrated synthetic rubber plant at Odessa, Tex. The butadiene facility, which cost $22 million, and the copolymer facility, which cost $10 million, will turn out 40,000 long tons of synthetic rubber a year (OGJ, Oct. 7, p. 110). The butadiene company is a combine of El Paso Natural Gas Products Co., United Carbon Co., and Odessa Natural Gasoline Co. General Tire owns the copolymer plant.

John M. Campbell, scientific director of the research staff of General Motors Corp., has been selected this year to receive the S.A.E. Horning Memorial Award. His lecture at the S.A.E. Cleveland meeting November 7 is entitled "Looking Ahead in Fuels for Automotive Transportation."

Kerr - McGee Oil Industries, Inc., will increase capacity of its 22,000-bbl. Cushing, Okla., refinery to 30,000 bbl. Kermac plans to enlarge to 23,000 bbl. a 16,000-bbl. crude unit it acquired from Tidewater Oil Co.'s nearby Drumright refinery (OGJ, Sept. 23, p. 75). This unit will replace a battery of shell stills. Kermac will continue operating a modern 7,000-bbl. crude unit built at Cushing in 1952. Litwin Engineering Co., Wichita, is studying the alteration of the old Tidewater unit.

A 300-ton synthetic-ammonia plant at Hammond, Ind., has been placed on stream by Calumet Nitrogen Products Co. Calumet, jointly owned by Standard Oil Co. (Ind.) and Sinclair Refining Co., takes cat-reformer hydrogen from their two refineries at nearby Whiting and East Chicago. Nitric acid and ammonia solutions are also being made, the latter tanking about 100 tons of ammonia per day.

Sinclair Refining Co. is adding a 1,200-bbl. M.E.K. dewaxing and deoiling unit at East Chicago. Scheduled for completion in about a year, the unit will replace existing sweaters. A lube distillate rerun still is also being built to replace the older equipment. Badger Manufacturing Co. has the construction contract. Badger also has a contract for an M.E.K. unit to be built at Atlantic Refining Co.'s Philadelphia refinery. This unit is slated for completion in 1959.

D-X Sunray Oil Co.'s new $1,000,-000 Harry T. Bennett Research Center was dedicated last week at the firm's 74,000-bbl. West Tulsa refinery. The new center was named after the company's chief chemist and technical advisor who has been with the refinery since 1920 and helped build the scientific and technical department.

Standard Oil Co. (Ind.) has begun operations at its new lubricating-oil plant at Casper, Wyo.—the only such manufacturing plant in the Rocky Mountain area. Four new units were installed to replace equipment which had been in use for 38 years. Capacity is 800 bbl. of lube oils daily.

New units include a 4,800-bbl. vacuum pipe still to prepare lube-oil fractions for further processing; a 1,000 - bbl., two - stage deasphalting plant using propane to separate asphalt from heavy lube-oil stocks; a 1,500-bbl. extraction unit that uses furfural as a solvent; and a 2,000-bbl. dewaxing plant.

Also for Refiners . . .

IN THE NEWS: Pontiac's unusual refinery has gone on stream (p. 66) . . . Tidewater's decision whether to go along may hold the fate of imports control (p. 67) . . . Thermal photography now can point refinery hot spots (p. 71) . . . Canadian refinery strike may set pattern for labor's 1958 program (p. 76) . . . Sun is extending its custom blending at the pump to northeastern states (p. 77) . . . The fuel appetites of jet planes have been surveyed (p. 80) . . . Swiss financier is backing a new West German refinery (p. 88) . . . Uruguay refinery is expanding and Guatemala may get its first refinery (p. 89).

PLUS THESE TECHNICAL REPORTS: Special report on process-stream analyzers (p. 93) . . . An isovapor-lock chart for blending gasoline (p. 110) . . . The Foreman's Page (p. 132) . . . Questions on Technology (p. 134) . . . PETROdatics (p. 137) . . . and Refiner's Handbook (p. 139).

Jet Eats 1,800 Gal. Per Hour

. . . but Mach .81 cruising speed will help turn a profit for airline. T.W.A. is making thorough study of high fuel costs

THE JET AIRLINER has a tremendous appetite for fuel. Just how hungry the big plane can really get has been told in a report to management by the jet-planning committee of Trans World Airlines.

T.W.A. has staked its future on jets. It has 63 on order—30 Convair 880's and 33 Boeing 707's (models 320 and 120).

The Boeing will consume kerosine at 700 gal. per hour while just idling on the ground. In flight, consumption will hit nearly 1,800 gal. per hour.

The planning committee told T.W.A.: "Our planning must be precise. The jet is less forgiving of errors. Its leverage for profit is good . . . but its leverage for loss can be calamitous."

The figures . . . Here are some fuel facts given T.W.A. management by the committee:

. . . The Boeing 707's will have a takeoff weight of 246,000 lb. to 295,000 lb., and the Convair 880's will be 178,000 lb. In comparison, today's super Constellation's is 156,000 lb.

. . . The Convair will be faster than the Boeing, and both will have top speeds just about double that of today's piston plane. The Convair will be able to hit 620 m.p.h., and the Boeing 707-320 (Intercontinental) 605 mph. The Boeing 707-120 will do 585.

. . . Fuel will make up 40 per cent of the weight of a fully-loaded jet plane, compared with 30 per cent for a piston plane.

. . . The Boeing will consume fuel at roughly five times the rate of today's big planes. The higher consumption rate will be offset a bit by the lower cost of jet fuel—about 5 cents a gallon less than for piston fuel.

. . . The cost of running a jet for an hour will be as high as $911, much of it for fuel. This is 236 per cent above the cost of operating a Constellation. The old workhorse, the DC-3, cost $75 per hour to run. When supersonic jets arrive, costs of $1,000 per hour will be "peanuts."

. . . Overhauls for jet airliners will run into big money. Each time a plane is taken out of service for checking, the cost will hit $25,000 to $35,000.

Sample flight . . . When the big Boeing 707-320 takes off on a transcontinental flight from Los Angeles to New York, it will need about 8,250 gal. of fuel—if everything goes on schedule. Actually, it will take on 12,500 gal., a 50 per cent hedge against emergencies.

Consumption will be heaviest at takeoff and during the initial climb. The plane will use up to 300 gal. of fuel and 1,000 gal. of water in the first 2½ minutes. Water is used for maximum thrust on the takeoff and initial climb.

The Boeing will climb to 10,000 ft. in 6 minutes and to its cruising altitude of 31,000 ft. in 28 minutes. Rising to the cruising altitude will take another 1,330 gal. of fuel. In the first half hour the consumption of fuel and water will reduce the takeoff weight by 17,200 lb.

Cruising speed from coast to coast will be at Mach .81, or 550 mph. Outside air temperature will be —52° F. Just 4 hours 22 minutes after taking off at Los Angeles, the Boeing will set down at Idlewild Airport.

Federal violation charged as . . .

. . . Pipelines Face Court Action

WASHINGTON. — The widening wave of the Government's attack on the oil industry threatens now to engulf most of the nation's big pipelines.

"Test case" motions have been filed by the Justice Department in the District of Columbia Federal Court charging four pipelines with violation of a 1941 consent decree.

If these suits hold up, a large number of the 53 pipelines covered by the decree may eventually face similar charges.

The 1941 decree limits the dividends from shipper-owned pipelines to 7 per cent of the value of the pipeline properties in the year preceding that of the dividend declaration. It also bans inclusion of leased pipeline property in the valuation.

Here are the Government's contentions against the four companies:

. . . Arapahoe Pipe Line Co. is charged with failing to deduct $26 million from the valuation of its common-carrier property before computing its shipper-owners' permissible dividend. This amount represented the share financed by or attributable to loans from third parties.

. . . Service Pipe Line Co. is charged with adding to its valuation certain additions and betterments and deducting certain depreciation and retirements before they were made.

. . . Tidal Pipe Line Co. is alleged to have paid excessive dividends by figuring them on the basis of a valuation of property owned "or" used, instead of property owned "and" used.

. . . Texas Pipe Line Co. is charged with incorrectly reporting allowable dividends to its shipper-owner on the basis of valuation of property used but not owned by it.

The 1941 decree ended a case filed by the Government against 53 common-carrier pipeline companies and their 36 company shipper-owners. The case charged violation of the Interstate Commerce Act and the Elkins Act by the giving and receiving of illegal dividends "under the guise of dividends and earnings."

Justice Department sources said that the decree has been violated for years. The suits are the result of some 4 years of investigation by the antitrust division.

The false inflation of property charged by the Government has resulted in dividends as high as 60 per cent or more, it was allegedly found. The result was that owners of pipelines could ship their oil much cheaper than could competitors using the same pipelines.

The suits were filed just a week before a House antitrust subcommittee planned to hold hearings on enforcement of the decree. Justice Department officials were scheduled to be heard this week on their enforcement policy and future programs.

Service to testify . . . At least one of the pipelines involved in the Justice Department's new move will have a chance to give its side of the story on consent-decree compliance.

The subcommittee, headed by Rep. Emanuel Celler of New York, will hear J. L. Burke, president, and J. L. Shoemaker, vice president of Service Pipe Line Co.

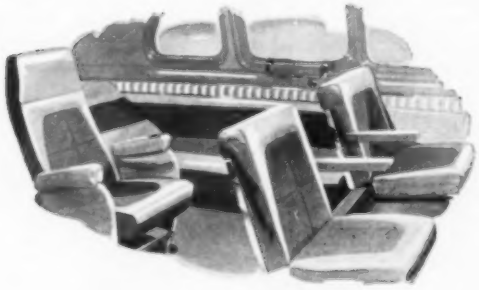
Hansen and Robert Bicks, his assistant, will lead off the hearings. James E. Moss, director of transportation for the American Petroleum Institute, and Fayette B. Dow, chairman of the A.P.I. committee on pipeline accounting, will be the first industry witness.

C. I. Thompson, counsel for Atlantic Refining Co. and secretary of committee that negotiated the consent decree, also will be heard.

Ever wish you had a "DOUBLE"?

Here's your Twin!

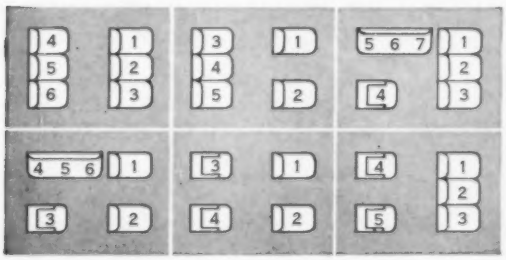
The magnificent new six-place Beechcraft Twin-Bonanza offers a **higher cruising speed, more payload,** carries **more cargo,** has **greater range,** gives **better performance,** has **more visibility,** more **passenger comfort,** is **more quiet,** has **more safety features,** a **better safety record,** comes **more completely equipped,** has a **higher resale value** than **any other airplane in its field!**



Supercharged engines enable you to fly half a continent non-stop—at speeds up to 240 miles per hour. With a '57 Beechcraft Twin-Bonanza, you can cut your travel time by as much as 75%!

See how **more** of your time can be your own with a new Twin-Bonanza! And how easy it is to own with the most complete finance and leasing plans in aviation. Your Beechcraft distributor or dealer will be happy to show you, or write Beech Aircraft Corporation, Wichita 1, Kansas.

There are six luxurious interior seating arrangements from which to choose. Each one is far **above** and **behind** whirling propellers, and easily accessible in a "no duck, no stoop, no stretch" entrance via airliner-type foldaway stairs.



Beechcraft Invites Comparison!

Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

THE CASE OF
THE OWNER WHO THOUGHT AHEAD
ART, THIS CAT* CARE SCHOOL SHOULD PAY OFF WHEN WE START ROLLING NEXT SPRING!
CAT
-AND SPEAKING OF SPRING, I'M GOING TO NEED SOME SERVICE WORK ON MY MACHINES TO BE SURE THEY'RE READY.
NOW'S THE TIME TO THINK OF THAT, TOM!
SUPPOSE WE MAKE UP A SCHEDULE FOR WINTER SERVICING OF YOUR EQUIPMENT. THAT WAY WE'LL GET THE MACHINES BACK ON THE JOB FASTER-MAKING MONEY FOR YOU.
NSON
RUCTION CO.
CATERPILLAR
SWELL! LET'S START WITH MY D6 ON MONDAY. WE'LL BRING IN THE OTHER EQUIPMENT ON A SCHEDULE AFTER THAT.
MONDAY'S FINE! NOW, LET'S MAKE A LIST OF JUST WHAT NEEDS TO BE DONE...
CATERPILLAR*
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.
CAT CARE FOR LONGER WEAR
LET ME SCHEDULE YOUR WINTER SERVICE NEEDS FOR YOU!
Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

Oil Pioneer Halliburton Dies

THE MAN who made oil-well cementing a standard practice in the industry is dead.

Erle P. Halliburton of Duncan, Okla., died last week after spending more than 40 years developing new and better ways to get oil out of the ground. The giant Halliburton Oil Well Cementing Co. of Duncan is a living monument to the success of his engineering and business skill.

Halliburton was more than an oil man. He was a farmer, sailor, railroad engineer, crane operator, salesman, gold miner, airline owner, inventor, luggage manufacturer, and philanthropist during his 65 years.

An enthusiastic hard-working individualist, Halliburton was active in managing his company until the last 3 years of his life, when illness forced him into semiretirement. He died at Good Samaritan Hospital in Los Angeles following a throat operation.

ERLE P. HALLIBURTON

... he showed the industry how.

Up from the farm . . . The man who was later to head a world-wide oil-well servicing firm employing 8,500 persons was world wanderer in his younger days. Born September 22, 1892, on a farm near Henning, Tenn., Halliburton left home at 14 to earn money for his widowed mother, a sister, and four brothers.

He operated a locomotive at a railroad construction camp, ran a steam crane loader for Mississippi River log barges, sold automatic stokers and smoke consumers, and then shipped out to China as a merchant seaman.

At the ripe age of 18 he enlisted in the Navy to really see the world and became an expert in engineering and hydraulics.

In 1916 came the turning point in young Halliburton's life. At 23 he was hired—and fired—by the Perkins Oil Well Cementing Co. in California. He was fired because he proposed a number of changes in the new-fangled method for mixing cement and water and pumping it into a well bore to support casing and prevent injurious fluids from reaching the oil formation.

He tried his luck in the Mid-Continent as a consulting engineer and developed his ideas during the Burkburnett boom in Texas. Strictly a shoe-string operator, he borrowed a mule team and a pump. His wife, whom he had married in California, had to pawn her wedding ring.

Job for Skelly . . . In 1920 he made his mark by cementing and taming a wild Oklahoma well owned by the oil pioneer W. G. Skelly. Four years later he incorporated Halliburton Oil Well Cementing Co. at Duncan.

By adding new services and improving on methods, Halliburton built one of the great organizations of the oil industry.

Halliburton had many sidelines. He operated an airline for 18 months in 1929 and 1930 and bought a gold mine in Honduras in the early 1930's and operated it until after World War II. He had big farming, ranching and hydroelectric projects, manufactured luxury aluminum luggage pieces, owned large real estate holdings around Los Angeles, invented a respirator because he had asthma, and quietly supported a large number of philanthropies.

The citizens of Duncan, where 17 per cent of the local sales tax is paid with Halliburton wages, held an "Erle P. Halliburton" day on May 1, 1953. On that occasion oil industry figures from over the world gathered to pay tribute to the city's No. 1 citizen.

He was voted into Oklahoma's Hall of Fame, but his death came 2 months before he was to accept the honor.

Funeral services were held in Los Angeles and memorial services at Duncan. Burial was at Forest Lawn. His wife, Vida C. Halliburton, died in December 1951. She had been a full partner in all his enterprises.

Halliburton served for a number of years on Oklahoma's Santa Claus Commission, an agency that distributed Christmas presents to orphans.

—— *Industry* briefs

Oklahoma's crude-oil allowable for November will remain at 600,000 bbl. daily, the same as the October and September allowables, according to Ray C. Jones, chairman of the Oklahoma Corporation Commission. Jones said no allowable hearing will be held for November. Production is running below the allowable due to pipeline proration.

Skelly Oil Co., Tulsa, has taken its first step into foreign operations. It is going to look for oil and gas in Canada. Activities will be directed from a new exploration division which has been opened in Calgary. John R. Gisburne is general manager of the geological department and Roy J. Winchester heads the land department. Both have been with Skelly for several years.

Dallas and Amarillo oil interests have agreed to pay $300,000 for a half interest in oil production owned by Luke F. Skaggs, Oklahoma City, in Hutchinson County in the Texas Panhandle. The buyers are El Tigre Oil Co. and Henry Rogatz, and Harry Glass, Amarillo. They bought a half interest in a 491-acre lease with 17 oil wells now producing about 220 bbl. daily. Skaggs retains the remaining half interest. Purchase terms include both cash and payments out of production.

Toklan Oil Co., Tulsa, has sold all its assets to Kirby Production Co., a wholly owned subsidiary of Kirby VenSyn, Houston. Toklan will receive 863,950 shares of Kirby VenSyn common stock. Toklan will be liquidated, and Kirby VenSyn stock will be distributed to Toklan stockholders at the rate of 84/100 share of Kirby for each Toklan share. The deal is subject to stockholder approval.

This will give Kirby VenSyn and subsidiaries daily net production of about 3,500 bbl. of oil and 6,500 M.c.f. of gas from properties in the U. S., Canada, and Venezuela.

Continental Oil Co. completed the 10 Navajo-A Pennsylvanian discovery in San Juan County, Utah, for 3,240 bbl. of 41°-gravity oil per day, cut 2-10 per cent basic sediment and water. This flow was on 1-in. choke. No tops are reported but the perforations are at 5,688-5,744 ft. Location is halfway between Desert Creek and White Mesa fields. Location has been made for the second well in the new field at 2 Navajo-B, a southeast offset.

New Recovery Firm

. . . formed with Johnston Murray as president. It will apply new steam-injection and combustion techniques to produce oil from viscous reservoirs

A NEW COMPANY using new methods for recovering highly viscous oil has been organized with former Gov. Johnston Murray of Oklahoma as the president.

Inventor of the processes is Dr. S. J. Pirson, professor of petroleum engineering at the University of Texas.

One process consists of steam injection to heat heavy crudes and tars, and the other is a new type of in situ combustion.

The new company will be known as Advanced Recovery Enterprises, Inc. Headquarters probably will be in Tulsa, although Murray plans to remain for the present at Fort Worth. Recently he resigned as a vice president of Welex Jet Services, Inc., which was absorbed by Halliburton Oil Well Cementing Co.

Test in Texas? . . . First application of the new method may be on properties of Frank Buttram, Oklahoma City, in Anderson County, Texas.

Buttram said no agreements, however, have been signed. He said the area has "a terrific amount of reservoir," but there is no pressure.

Officers of Advanced Recovery Enterprises, Inc., in addition to Murray, are Anthony Gibbon, Tulsa, vice president, and Dan W. Cameron, Tulsa, secretary-treasurer. Directors are Pirson and Gordon Jackson, Denver, vice president of Eastman Oilwell Survey Co.

Pirson worked 7 years for Stanolind Oil & Gas Co. (now Pan American) as special research associate and resigned in 1956 to take the University of Texas post, which he will retain.

Pirson discovered the special type of steam-injection geometry required for effective extraction while conducting research at the university on a project sponsored by the Fordee Rhoades Oil Corp., Tulsa, last year.

As a result of the joint efforts of Fordee Rhoades and Pirson, each holds a 50 per cent of the rights under patent applications filed in the United States and Canada.

Pirson said that while steam injection undoubtedly will give a high recovery efficiency, it has some inherent shortcomings. One is the loss of heat as the steam is pumped from the surface to the producing formation.

Combustion technique . . . Pirson developed another thermal process by which the source of heat is obtained at the expense of the crude oil itself and in which cracking also is performed.

This was developed after the Fordee Rhoades research grant had expired.

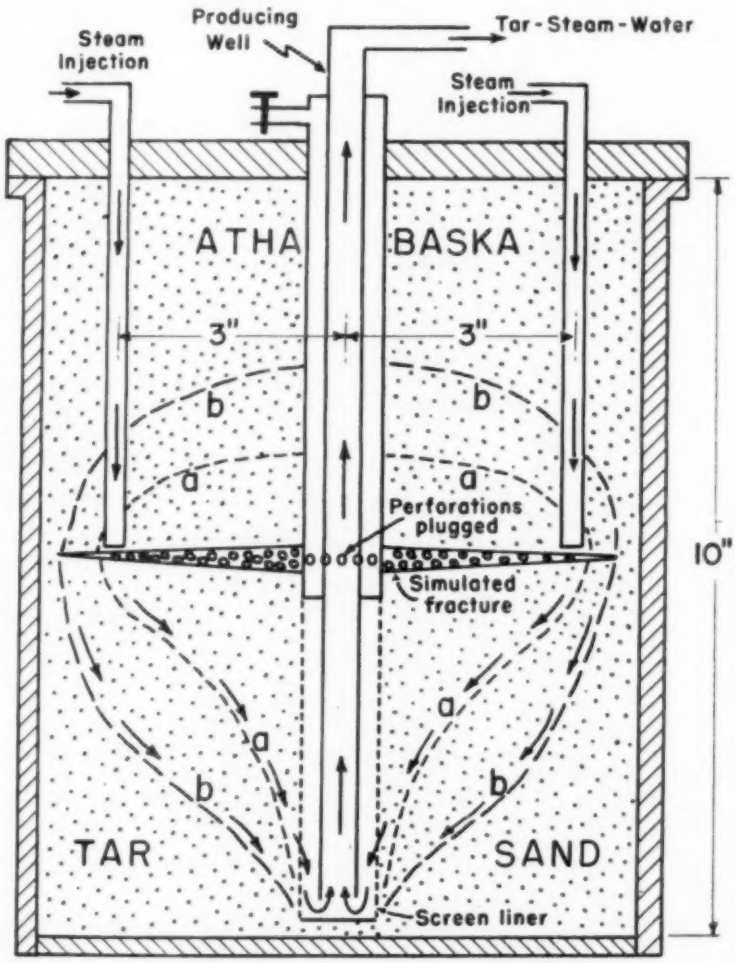
The combustion technique is similar in many respects to steam injection. But one major difference is that, with combustion, a single well can be used. As in steam injection, gravity is used in both methods to drain the melted and cracked crude or tar toward the bottom of the reservoir. At that point it is pumped or flowed to the surface, depending on gas pressure.

Tar experiment . . . Pirson tried in the laboratory a single-well combustion operation for Athabaska tar recovery.

Tar combustion was started in the center of the sand pack with an electric heater. Combustion was discontinued after an hour, and the burned out zone proved to be pear-shaped with the small end at the bottom of the well.

The sand within the burned-out zone was fused and consolidated by products of cracking and had no permeability to gas. Hence, the injected air had to flow around the burned-out zone to maintain combustion on the surface of the zone.

The melted tar gravitated to the bottom of the well, at which point it was lifted to the top of the container by the gases of combustion.



STEAM-INJECTION METHOD is demonstrated by this laboratory model. Melting surfaces "a" and "b" show positions at succeeding times as heated area is enlarged.

Pirson says that in a single-well combustion operation in the field the volume affected probably would not extend more than 50 ft. from the well. To widen the area of influence, he proposes a well pattern similar to that used in water flooding, with four injection-combustion wells at the corner of a unit square (100 to 200 ft.) and a center producing well.

The advantages . . . Pirson cites three advantages of his method for recovering viscous oils and tars by combining in situ combustion and gravity drainage:

. . . The heat for melting and cracking oil is generated at the expense of the oil itself. Since only air compression is required, surface operations are less complicated and less expensive.

. . . The process may be tried by a single well operation, and its engineering feasibility may be established at relatively little expense.

. . . The process eliminates the problem of fluid blocking that occurs in other underground combustion systems.

How Big Is Jersey?

Prospectus puts the tape measure on its holdings

NEW YORK. — Some interesting facts about the world's biggest oil company came out last week.

In a preliminary prospectus issued in connection with a $250-million to $300-million stock sale, Standard Oil Co. (N. J.) revealed that at the end of 1956 it had:

. . . Gross reserves of 29,841,000,000 bbl. of oil.

. . . Net reserves of 21,940,000,000 bbl. of oil.

Jersey's stock sale is the second largest common-stock offering in the history of U. S. financing (OGJ, Oct. 7, p. 103). The money will be used "for future capital expenditure."

Jersey also said its proved acreage is 1,974,200 out of total holding of 218,161,700 acres.

Its net producing wells at the end of last year numbered 27,160. These include 18,948 in the United States; 2,859 in Venezuela; 2,230 in Canada; 2,151 in other Western Hemisphere countries; 451 in the Far East: 423 in Europe and Africa; and 98 in the Middle East.

The figures include all holdings of affiliated companies in which Jersey holds interest of 50 per cent or more. Holdings of other affiliates are included, but are based on the per cent of Jersey ownership.

Pipeline briefs

Trans Mountain Oil Pipe Line Co. has completed a looping and station expansion program that increased capacity to 250,000 bbl. per day. This is more than double the estimated October throughput of 110,000 bbl. per day. October deliveries are down from September by 27,242 bbl. per day. Decreased throughput stems from a temporary shutdown at a British Columbia refinery. Trans Mountain, which originates at Edmonton, serves refineries in Washington and British Columbia as well as tankers docking at Vancouver.

Kerr - McGee Oil Industries, Inc., will build 24 miles of 4-in. gas lines in Blocks 21, 22, and 32 to connect wells with its Breton Sound production island off the Louisiana coast. The wells are located off Plaquemines and St. Bernard parishes. The project will permit an increase in deliveries to Southern Natural Gas Co. from 17,000 M.c.f. to 25,500 M.c.f. per day. Contract was due to be let last week.

Southern Natural plans a 12-in. line extending from about 8 miles offshore to three platforms in the Breton Sound area. Plans for the line, and one by The California Co., have been filed with the Corps of Engineers. Calco plans a 3-in. gas line to a platform east of Ostrica, La.

Four Corners Pipe Line Co. has let the contract for a Colorado River crossing at Needles, Calif., to R. H. Fulton & Co., Lubbock, Tex. Dredging is under way on the crossing. Fulton has 315 miles of the 635-mile, 16-in. main line from Aneth field, Utah, to Los Angeles. The contractor will wind up Section 3, which is 98 miles from Cameron to Seligman, Ariz., this month. Another spread has already started on Section 5, from the Colorado River west to Olive, Calif. The spread on Section 3 will go to Section 6, from Olive to Twentynine Palms, Calif.

Trans-Prairie Pipe Lines, Ltd., has laid 20 miles of 4 and 6-in. crude lines from Weyburn to Halbrite field in Saskatchewan and plans to complete another small line this week. The latest project is 10 miles of 4-in. between Virden and Routlege fields in Manitoba. Both jobs were contracted to Henuset Brothers, Ltd., Virden, Man. Trans-Prairie delivers crude to Producers Pipelines, Ltd. (formerly Westspur), and Interprovincial Pipe Line Co.

Permian Basin Pipeline Co. is welding with an unusually narrow bevel of 20° on a pipeline project near Eldorado in Schleicher County, West Texas. Permian, an affiliate of Northern Natural Gas Co., is departing from the usual 30° bevel on 33 miles of the 83-mile, 16-in. line. Objective of the narrow bevel, which requires less metal deposit in welding, is economy and speed.

Lone Star Constructors, Dallas, has the contract on the line, which extends from Permian's Spraberry compressor station to a connection with Pioneer Gathering Systems, Inc., facilities. Welding with the 20° bevel will continue until about November 15. Afterward construction will continue on part of the remaining 50 miles which is being laid with the 30° bevel of the type commonly used in pipelining.

Construction work will start this month on Forest Pipeline Corp.'s 33-mile crude line from Wyoming's Grieve pool to Casper. The 8-in. line will connect with Platte Pipe Line Co. facilities at Casper. Completion is set for early December. Forest Pipeline is a subsidiary of Forest Oil Corp., which operates 18 wells in Grieve pool, capable of producing more than 5,000 bbl. daily. The crude is now being trucked to Casper.

Also for Pipeliners . . .

IN THE NEWS: Pacific Northwest Pipeline is on its way to becoming one of the nation's largest gas transporters (p. 72) . . . Gulf and Texaco may be willing to sell their Oklahoma gathering systems (p. 74) . . . U. S. Steel plans a 13-mile, 55-in. line (p. 76) . . . Transcontinental announces a stepped-up expansion program costing $139 million (p. 78) . . . Four pipeline firms face government court action over profits (p. 80) . . . Tunisia wants pipeline to move French oil across its territory but doesn't want French troops to come with it (p. 86).

PLUS THESE TECHNICAL REPORTS: Automatic operation is indicated for most gas-pipeline systems (p. 118) . . . and Pipeline Patrol's report on covering lines in creek beds (p. 141).

President Bourguiba changes mind, makes point, says . . .

Tunisia Wants Pipeline

● **In an exclusive interview, president of Tunisia tells the Journal a pipeline moving French oil through Tunisia would firm up his country's currency. But he wants it on his terms—no French troops. Tunisian line would eliminate Libyan route (see map).**

PRESIDENT HABID BOURGUIBA of Tunisia not only approves of the idea of a French pipeline to move Saharan oil across his country, he would welcome such a proposal.

The French, who by this time should be almost immune to shock in their dealings with Bourguiba, will no doubt find this surprising. It has been generally conceded that the Tunisian president would be hard to deal with. His obvious and often expressed sympathies with the aims of Algerian nationalists have given both the French and the world in general the idea he probably would turn down any pipeline deal.

He dispelled this idea exclusively to The Oil and Gas Journal.

Bourguiba concedes that the French have not approached him officially with a pipeline proposal. He says only feelers have been made up to now. He thinks a pipeline would be a good deal for Tunisia—if operated on his terms.

The money angle . . . Bourguiba points out that Tunisia belongs to the franc zone. All its 7,800 bbl. daily petroleum requirements must be imported from outside franc currency areas. Tunisia has no other energy sources to fuel the industrial development he has planned for the country. Obviously, French franc oil moving through a pipeline across Tunisia would open the way to a sound currency situation for his own oil needs.

The peppery president made it clear that he will not allow France to station troops on Tunisian soil or to build airports to guard the pipeline. The best Tunis rumors have it that the French want to make this a condition of any pipeline proposal.

Once the premier of Tunisia under a 1956 French program to give the colony its independence, Bourguiba less than 90 days ago deposed Bey Sidi Mohammed Al-Amin, nominal ruler of the country for 14 years, and made himself president of a new Tunisian republic. He is accustomed to defying the French and has been doing it most of his political life as head of the country's dominant Neo-Destour (Independence) party.

Doubts French ability . . . Bourguiba thinks the logical pipeline across Tunisia would begin at Edjele, the shallow producing field now being developed practically on the Algerian-Libyan border (see map).

Enough 16-in. pipe is already on order in France to build the line to the Libyan coast between Tripoli and Tunisia's Gabes, or to Gabes or Sfax on the Tunisian coast (OGJ, July 1, p. 102).

Bourguiba thinks the route to either Gabes or Sfax would be preferable. He cites two reasons:

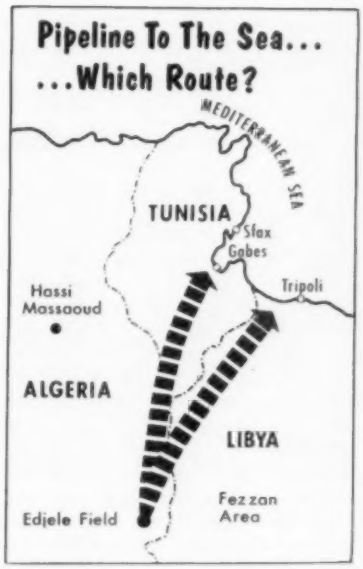
. . . The Tunisian line would be slightly shorter than a line through Libya.

. . . It would lie entirely in franc currency areas. Libya is in the sterling bloc, and its Libyan pound is closely tied to British currency.

The only hitch to the whole proposition is that Bourguiba doesn't think the French will ever move their Saharan oil to the Mediterranean without first settling with the Algerian nationalists. A line through Tunisia would be almost as vulnerable to sabotage as one entirely through Algerian territory because it would have to be laid through a large tract of Algerian territory before it reaches the Tunisian border.

Bourguiba didn't say so, but such a line might also be vulnerable to sabotage inside Tunisia. The French have charged repeatedly that Algerian nationalists have used Tunisian bases for raids into Algeria. Bourguiba denies this, but French troops have created incidents by entering Tunisia in what they call "pursuit" of these raiders. The Tunisian president is asking for American arms to combat what he calls violations of his territory by the French.

French alternatives . . . The French have a choice of building either through Tunisia or Libya. An all-



Algerian route would be extremely difficult to lay from a geographical standpoint. It would also be hard to justify economically unless the Edjele field is larger than reports now indicate.

If, however, Standard Oil Co. (N.J.) and other American companies now prospecting in Libya's Fezzan should come up with sizable production this could change the picture. A joint French-U.S. line to carry both the Edjele and Fezzan production to the Libyan coast might be a possibility. Jersey Standard is drilling immediately across the border from Edjele on what may be the same structure.

A joint pipeline would, of course, require not only agreements with the American companies, but also the Libyan Government. Libya runs Tunisia a close second in its sympathies with the anti-French Algerian nationalists.

A route across Tunisia would be short and direct if the French and Bourguiba could come to an agreement. Actually it probably would benefit Tunisia as much or perhaps more than it would the French. It would be a boon to fuel-short Tunisia.

Hassi Messaoud line . . . The French apparently have decided definitely to keep their proposed pipeline from Hassi Messaoud to the Mediterranean entirely in Algerian territory. Planned as a 24-in. line, it would terminate at Bougie.

This would take the line through some of the more highly populated nationalist strongholds in northeastern Algeria. Such a route makes it more vulnerable to sabotage than the Edjele line no matter what its route eventually.

The French now plan to parallel this larger diameter pipeline with roadways for constant patrolling throughout its entire length. Those who have tested the temper of the Algerians believe it will take more than this to move the oil.

First pipe of a small, temporary 6-in. pipeline from Hassi Messaoud to the railhead at Touggourt was laid early this month. The French expect to complete the 93-mile line by the end of this year and have crude moving by rail to the Mediterranean.

This small-diameter line is expected to move 500,000 tons of Hassi Messaoud oil a year (about 10,000 bbl. daily) to the Mediterranean coast by pipeline and railroad.

The big hitch is that the oil must move through the rugged Atlas Mountains of northeastern Algeria by rail after it once is moved to Touggourt. The mountains are a rebel stronghold, and the favorite outdoor sport of the rebels these days is blowing up French trains moving along this railroad.

Tensions ease . . . Bourguiba tossed the French another shocker last week when he suddenly reversed his plans to recall the Tunisian ambassador to Paris.

The fiery Tunisian president said earlier he was calling the ambassador home because French planes violated Tunisian territory and attacked a village on the Tunisian side of the Algerian border. He suddenly switched signals and said he was leaving Mohammed Masmoudi in Paris because of the "conciliatory intentions" of the French.

Bourguiba's latest step may smooth some of his differences with French officialdom and pave the way for a pipeline proposal.

Greek Plant Needs Operator

GREECE'S NEW 30,000-bbl. refinery is about ready to go on stream, but no one yet knows who will operate it.

The $20-million plant was built to American specifications with German equipment and financing. It was built by Hydrocarbon Research, Inc., of New York and its German subsidiary, Hydrocarbon Mineralol of Dusseldorf, and the German firms, Friedrich Krupp Maschinen and Stahlunion Export.

The Greek Government asked for bids from prospective operators several months ago and got six bids (OGJ, July 22, p. 70). Last week the government was trying to decide whether the plant should be operated by the state, a foreign firm, or a Greek national firm. Socony Mobil Oil Co. was the only American oil company to make a bid.

Pipeline Deal Jells

TIPSA gets contract for two major Argentine lines

THE FINAL $180-million contract for construction of two Argentine pipelines was signed last week by Yacimientos Petroliferos Fiscales and the TIPSA combine.

Y.P.F. got governmental approval to make the deal with TIPSA in August, but has been negotiating several terms of the contract with the combine since that time (OGJ, Aug. 12, p. 93).

The contract calls for two major pipeline jobs. One to be a 1,015-mile, 24-in. natural-gas line from Campo Duran field to Buenos Aires. The second project will be a 580-mile, 12-in. crude line from the same field to the river port of San Lorenzo. Both are to be completed within 29 months.

The TIPSA combine includes Fish Engineering Corp.; Fish Northwest Constructors, Inc.; Clark Bros.; and North American Utility & Construction International Co.

New Area Opened

Atlantic's Venezuela test hits south of Pedernales

ATLANTIC Refining Co. has apparently found a new producing area in eastern Venezuela. Its third test on a 36,500-acre concession, jointly held with Seaboard Oil Co., flowed 300 bbl. a day. The concession is south of the old Pedernales field which has been producing since 1933.

The Atlantic-Seaboard concession lies south of the town of Pedernales. Part of the Pedernales field is on the island of Cotorra in the extreme southwest corner of the Gulf of Paria.

The well was drilled to a total depth of 5,364 ft. Formation troubles prevented further drilling. The well was then plugged and upper formations were tested. The production was found at 1,848-60 ft.

This was the third well drilled on the concession. Both prior wells were dry. Atlantic and Seaboard each has a 50 per cent interest in the concession. Atlantic also has a new 14,820-acre block northeast of Pedernales. The firm gained the new concession at the big letting earlier this year.

Italy Counts on Egypt

● Expects to lift 20,000 bbl. a day from Sinai fields by next year; this plus a hoped-for 40,000 bbl. from the Adriatic and Sicily would just about fill refining needs

ITALY EXPECTS to be refining at least 20,000 bbl. daily of Egyptian crude from the Sinai Peninsula fields by next year.

Enrico Mattei, the politician-head of Ente Nazionale Idrocarburi, makes that estimate of Italy's share of the Egyptian crude. E.N.I., the government oil agency in Italy, is now lifting about 12,000 bbl. daily from the Egyptian fields which it operates with the Egyptian Government, Petrofina, and Swiss banking interests.

This would indicate that Mattei is making at least some progress toward his avowed goal of supplying Italy with crude that he doesn't have to buy. The 20,000 bbl. daily actually would make a small dent in Italy's crude needs, but Mattei thinks it will be supplemented with oil from two other sources—to say nothing of the oil he expects to find in Iran.

Mattei's E.N.I. has interests in about 90,000 bbl. daily of Italy's total refining capacity of about 550,000 bbl. daily. About half of the E.N.I. refining capacity, however, is in partnership with the world's major companies who have their own crude supplies.

Mattei hopes by 1958 to have enough crude to make E.N.I. self-sufficient as far as its share of the refining is concerned. He expects to lift 20,000 bbl. daily from Egypt, another 20,000 bbl. daily from the heavy-crude field his concern is now developing at Gela in Sicily, and 10,000 bbl. daily from Italy's Adriatic fields.

Less optimistic observers question the production figures from Gela and are openly skeptical that the Adriatic fields in the Abruzzi region can make 10,000 bbl. daily within that time.

It was in this same Abruzzi region where Cities Service Co. in partnership with Montecatini, the Italian chemical combine, made Italy's most spectacular discovery. Cities Service left Italy because of what the company regards as unfavorable oil laws. Gulf Oil Corp. pulled out of the country after its first two flush oil wells went to water.

The Gela field in Sicily is now producing about 4,200 bbl. daily and only 1,100 bbl. daily is being taken from the E.N.I. wells at Abruzzi.

Egyptian production . . . Mattei's best bet to furnish Italian-owned crude to his Italian refineries is from the Egyptian fields.

Figures currently being quoted by the Italian oil chief would indicate that Feiran, Belayim, and Abu Rudeis fields in the Sinai Peninsula are producing about 24,000 bbl. daily. The fields are operated in the name of Oriental Oil Co. of Egypt, 49 per cent owned by the Egyptian Government. The remaining 51 per cent is controlled by International Egyptian Oil Co., now held by E.N.I., Petrofina, and Swiss bankers. E.N.I. has the lion's share of International Egyptian and is actually operating the fields.

The fields are on a 60-sq.mile concession on the Gulf of Suez side of the Sinai which was held by a Standard Oil Co. (N. J.) affiliate until 1949. Jersey walked away from the concession after doing all the preliminary work. Jersey regarded Egyptian oil legislation as unfavorable.

The Feiran and Belayim fields were then initially drilled and developed by Southern California Petroleum Corp., Los Angeles, which held a minority in the original International Egyptian company. Southern California sold its interest last year (OGJ, Aug. 6, 1956, p. 72).

Since then 20 wells have been completed in Belayim field and two at Abu Rudeis. Four or five produce at Feiran. All three are sizable structures and extend westward under the waters of the Gulf of Suez. Some of the producing wells are slant holes producing from underwater locations. Actual overwater drilling from platforms is next.

Abu Rudeis is the newest of the fields. It is now producing about 1,800 bbl. daily from the first two wells completed. A third is drilling.

Under the agreement which the Italians have with Egypt, half the Sinai field production can be taken by the Italians until Egypt reaches the point where she is self-sufficient in crude. Then the Italians can increase their liftings. Presumably, Mattei's E.N.I. is moving all the Italian-Petrofina share of the crude at present.

Petrofina owns 33,000 bbl. daily of refining capacity in Italy and is about to build a new 40,000-bbl. refinery near Rome in partnership with E.N.I.

Egypt's refining capacity now totals more than 70,000 bbl. daily. The country's total crude production has fluctuated pretty wildly from one month to another since the Suez crisis. But recently it has been rising steadily.

Neutral Zone crude will supply . . .

. . . New Refinery in Germany

A NEW and independent West German refinery promoted by a Swiss financier will be built by a California contractor and will operate on Middle East crude furnished by American Independent Oil Co.

Ralph M. Parsons Co., Los Angeles, has been awarded the contract for a 30,000-bbl. daily refinery at Emden. The plant will be built for a newly organized German company, Erdoelwerke Frisia, A.G.

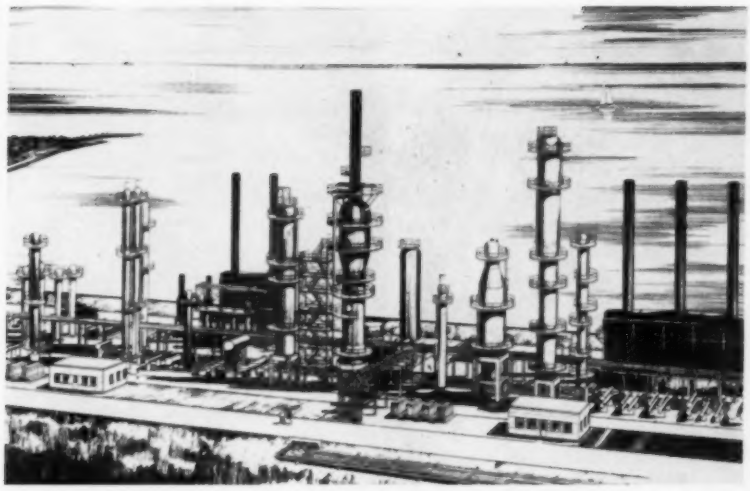
Frisia is the offspring of Gottlieb Duttweiler, Swiss financier who heads the Migros Co-operative, a large grocery merchandising concern. The co-op organized a gasoline marketing subsidiary, Migrol, several years ago and started gasoline price wars with the major Swiss marketers.

Duttweiler will actually have only a small financial interest in Frisia, but his firm will take at least 1,500 bbl. daily of the refinery's expected 5,000-bbl. production of gasoline.

Migrol's initial holding in Frisia amounts to only 3,000,000 deutschemarks (about $716,000 at the official exchange rate). American Independent, which will supply Wafra crude from the Neutral Zone under a 15-year contract, will have a 4,000,000 deutschemark interest (about $953,000 at the official rate).

Emden shipbuilding firms and other German industrial investors will furnish capital, and at least half the interest in Frisia will be sold to small private German investors.

Major output of the new refinery will be fuel oil, but Paul Conrad, deputy chairman of Frisia, said in Germany last week that the company plans to produce a regular grade of gasoline with an octane number of 92 and a super grade of more than 100 octane. The refinery is expected to go on stream in 1959.



Artist's sketch shows how:

Uruguay Refinery Expanding

CAPACITY OF URUGUAY'S only processing plant, the 28,000-bbl. La Teja refinery at Montevideo, is being doubled.

The government-owned Administration Nacional de Combustibles, Alcohol y Portland (ANCAP), has awarded a contract for the $11-million expansion job to M. W. Kellogg Co. (OGJ, Aug. 26, p. 88).

The new units will be a 28,000-bbl. atmospheric crude unit; a 10,000-bbl. vacuum unit; a 5,000-bbl. fresh-feed Orthoflow fluid catalytic cracker; a 3,000-bbl. Sinclair-Baker-Kellogg cat reformer; a gasoline-stabilization and gas-recovery unit; and a 4,500-bbl. gasoline treating unit.

They will be laid out in a typical in-line arrangement to reduce maintenance problems and pipe runs. In addition to handling design and engineering, Kellogg will procure materials for the project. Advisory construction personnel will be supplied by Kellogg Pan American Corp.

Refining Debut for Guatemala

UNITS from a shutdown refinery in Louisiana would form the nucleus of Gautemala's first refinery under an application now pending with the Guatemalan Government.

Breaux Bridge Oil & Refining Co., Inc., is expected to receive the first permit under Guatemala's 1955 Petroleum Code for construction and operation of a refinery in the Central American country.

The unit, having a capacity of about 2,500 bbl. daily, would operate on Venezuelan crude and would supply about 30 per cent of Guatemala's petroleum products.

Plans call for dismantling the 1,600-bbl. Breaux Bridge refinery near Lafayette, La., and shipping key units such as the crude unit and thermal cracker to Guatemala. If the permit is granted, Grebe & Doremus Process Co., Houston, is expected to get the contract for dismantling the old plant, remodeling units to be salvaged, and construction of the new refinery.

Guatemala's first refinery would be built in the Santo Tomas area of Izabal Province on the Caribbean Sea. New units to be erected would include a Unifiner of about 1,200-bbl. daily capacity and a 650-bbl. Platformer.

Products would include 95 and 87-octane gasoline, kerosine, diesel oil, bunker oil, and L.P.G. In event commercial crude production is established in Guatemala, plans call for shifting to local feed stock.

James S. Shively, Houston, president of Breaux Bridge, said present shutdown facilities in Louisiana probably would represent less than 10 per cent of the Guatemala installation.

Shively and fellow Houstonian Robert H. Baker, an independent operator, bought out the Breaux Bridge firm in late 1956 and discontinued operation of its Louisiana plant.

———World briefs

Commonwealth Oil Refining Co., Inc., is going on stream at its new No. 2 plant at Guayanilla, Puerto Rico. The plant, rated at 33,000 to 35,000 bbl. daily, was making runs up to 15,000 bbl. per day earlier this month. A 26,800-bbl. Houdriflow unit was scheduled to go on stream later this month. By year's end the Houdriforming and polymerization facilities will be completed. Commonwealth's other plant at Guayanilla is operating at full 23,500-bbl. capacity. It began operations in 1956.

Puerto Rico has one other refinery. Caribbean Refining Co.'s 13,500-bbl. plant at San Juan went on stream in 1955.

J. Ray McDermott & Co., Inc., was drilling below 14,000 ft. last week in the first oil test off the coast of Nicaragua. The well is about 25 miles from shore in the Caribbean Sea (OGJ, Apr. 8, p. 85). Associated with McDermott in the test are Waterford Oil Co., New Orleans, and Warren Petroleum Corp., Tulsa.

By the end of this year the French will have spent more than $127 million looking for oil in the Sahara Desert, almost $53 million of it in 1957.

The French Algerian ministry revealed the figures last week along with the prediction that it expects Saharan oil production to be a minimum of 160,000 bbl. daily by 1960 with the possibility of a top of 280,000 bbl. daily by that time.

Atlantic Refining Co. plans to spud the first of several deep wildcats on its Pinar del Rio holdings in Cuba before the end of this month.

The first well, a 9,000-ft. test, will be drilled near Los Palacios about 60 miles southwest of Havana. Jones Brothers Drilling Co., Shreveport, is moving its rig onto the location.

Coastal Plains Oil Co., which recently merged with Sloane Exploration Co., is preparing to drill its first well in Guatemala.

A. F. Lavender, Coastal Plains president, said the company has 160,000 acres of oil and gas concessions and 200,000 acres of mining concessions in the Central American country. Coastal Plains, formerly known as Mizpah Divide Mining Co., has offices in Reno, Nev., and Houston.

Storey Sloane, vice president of the new company, previously had moved a rig to Guatemala to start exploration on one of the oil and gas concessions there (OGJ, July 29, p. 125).

New Firm Banks on Cuba

Big blocks change hands. Cuban Land & Oil Royalty Co. gears for geologic study and more foreign investments

CUBAN LAND & Oil Royalty Co. has buttoned up a big deal in Cuba, exchanging stock for more than 1,300,000 acres of concessions and overriding royalties on nearly 20,000,000 acres.

This is the first step in a foreign program for the new company, which is starting out with $1,000,000 in operating capital and several big names behind it.

A contract has already been signed for geological information on the Cuban properties. The firm plans to change its name to Pan American Land & Royalty Co., broaden its holdings in Cuba, and move into other foreign areas.

The Cuban deal, first reported by the Journal last spring (OGJ, May 13, p. 87), was formally approved by all parties in New York last week.

The 1,301,087 acres ot concessions was turned to Cuban Land & Oil Royalty by the Domo group of Cuban oil companies. The acreage consists of relatively small blocks sprinkled over six of the island's seven provinces. It also includes some offshore tracts.

The overriding royalties include 1.3 per cent on about 15,000,000 acres. This is primarily in the area now being explored by Cuban Stanolind Oil Co. The other royalty includes 1 per cent on an additional 4,200,000 acres of Cuban onshore lands and tidelands. The royalty covers nearly half of Cuba's land area.

All royalty interest was acquired from Trans Cuba Oil Co., Cuban Venezuelan Oil Voting Trust, and White Eagle International Oil Co.

Who's behind it . . . Board of directors of the new firm includes Ralph Bard, president of Chicago-Canadian Holdings, Ltd.; Guillermo Belt, former Cuban ambassador to the U. S.; H. N. Mallon, chairman of Dresser Industries, Inc., Dallas; W. Rufus Brent, vice president of Producing Properties, Inc., Dallas; F. Lee Moore, Jr., of Kidder, Peabody & Co., New York investment house; and Jay H. Schrafrann, partner in the law firm of Arismendi, Brigard & Parraga, New York.

Brent, one of the organizers, has been acting as president. The company will elect a permanent president soon and will open offices in Dallas and Havana.

The firm now has 2,230,850 shares outstanding. Of this total, $1,230,850 was swapped for the Cuban properties.

Acreage located . . . The Cuban companies turning over concession rights to Cuban Land & Oil Royalty includes:

. . . Petrolera Domo S.A., 3,227 acres near Bacuranao-Cruz Verde oil field in Havana Province.

. . . Petrolera de las Seis Provincias S.A., 301,700 acres adjoining Cuban Stanolind acreage in Oriente Province at the east end of the island and in the tidelands off the south coast of that province.

. . . Petrolera Sherri, 462,250 acres principally in tracts in Las Villas, Camaguey, and Oriente provinces, and including some tideland blocks (acreage formerly held by Petrolera Domo).

. . . Petrolera Picuba, 130,890 acres principally in Matanzas Province in the north central part of the island.

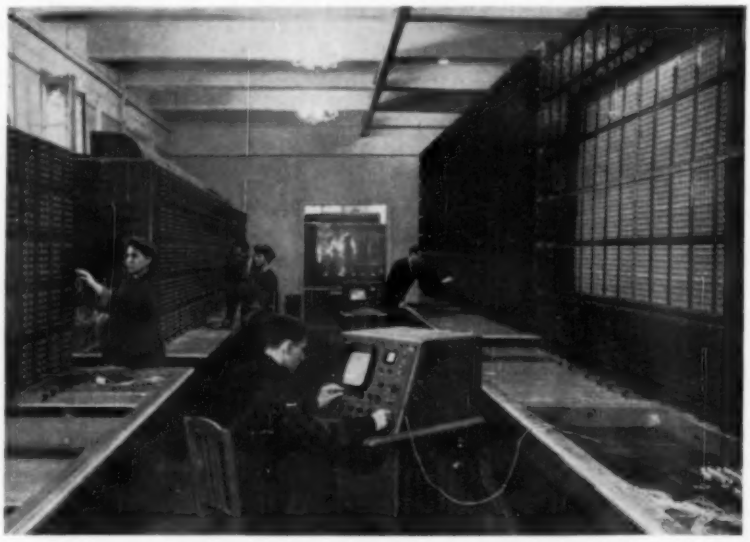
. . . Empresas Petroleras Oro Negro, 403,020 acres principally in Oriente Province.

Cuban operating plans . . . For the present, Cuban Land & Oil Royalty plans to do no exploratory drilling.

It will concentrate instead on developing geological information obtained through a management contract with DeGolyer & MacNaughton, Inc., Dallas.

The company also plans to negotiate some farmout agreements and to add to its Cuban holdings with further purchases.

It may, Brent said, do a limited amount of development drilling on its leases near Bacuranao - Cruz Verde field to evaluate this acreage.



Soviets Using Oil-Field "Brain"

THE RUSSIANS have a potentiometric device similar to ones in the United States for computing the ultimate life of a reservoir and the best way to produce the oil. They call it an "electrointegrator" and have installed it at the U.S.S.R. Oil and Gas Research Institute in Moscow.

Operators above are feeding the machine figures on reservoir production and behavior to determine the future productivity of a field. As explained by the Tass news agency, "the mathematic expression of the laws governing movement of oil in subterranean deposits coincides with the mathematic expression of the laws governing the passage of electric current through conducting plates."

The machine can calculate in seconds what would take decades to determine in producing a reservoir. It can, for example, take production statistics on 750 oil wells in a field and select the best practical method for exploiting the reservoir.

While the Russians call it a "new unique machine," reservoir engineers in the United States some years ago developed similar electronic methods for calculating the life and productivity of a field.

Aggressive drilling research

—another reason why you can look to Hughes for constantly improved bit performance

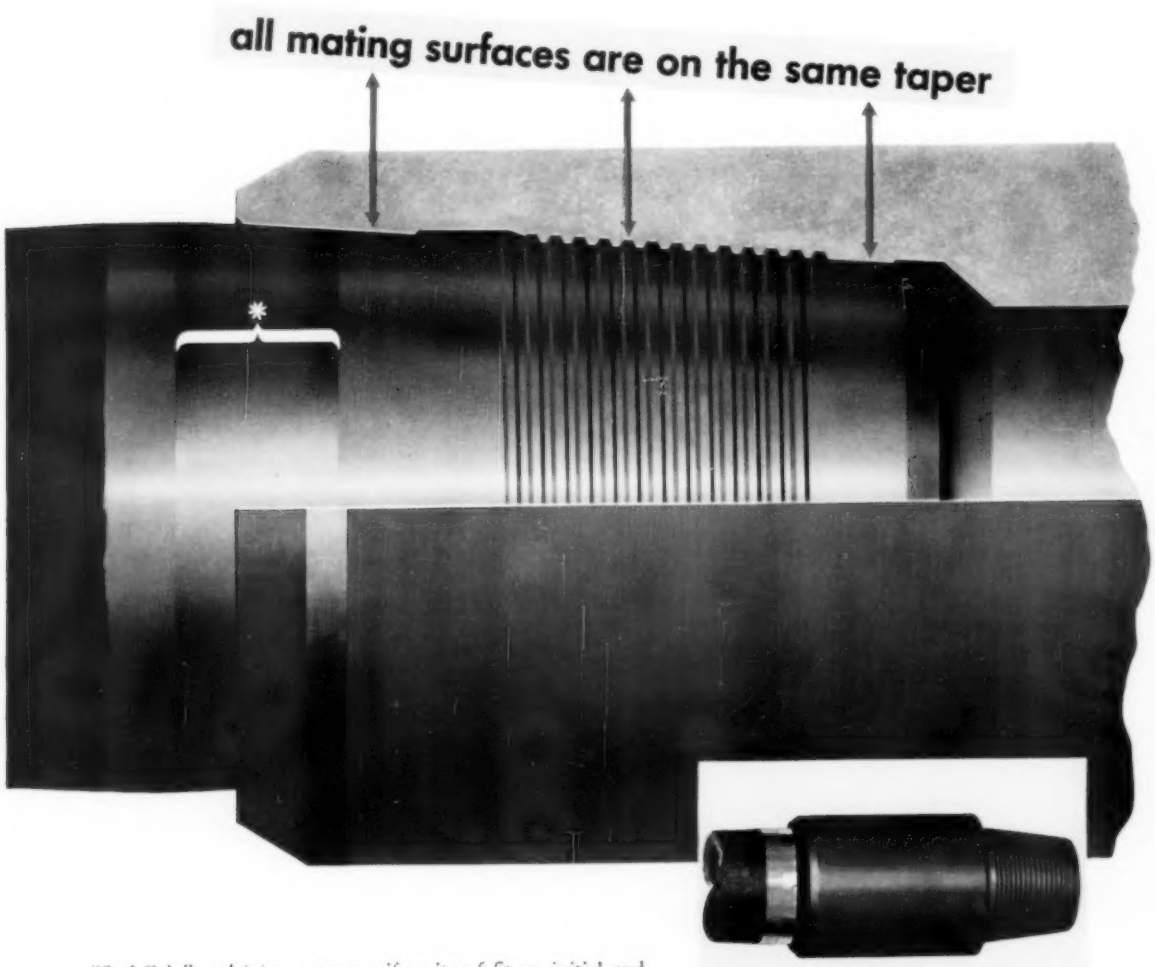
Every major improvement made to date in cone-type bits can be traced directly to Hughes Tool Company's continuing drilling research—spanning nearly half a century.

Step into the block-long Hughes research and engineering laboratory today and you'll find more men and equipment engaged in drilling research than ever before.

Go into the field and you'll find a greatly augmented staff of engineers gathering facts about bit performance to be relayed to the research laboratory for analysis and final evaluation.

Out of the millions of dollars being spent annually by Hughes in research are coming constantly improved bits to help you make hole faster and more economically.

Your most versatile replaceable tool joint



"Seal-Grip" tool joints assure uniformity of fit on initial and replacement installations because all mating surfaces — the *outer seal, pipe threads* and *inner seal*—are on the same taper.

This means that whether you install new "Seal-Grip" joints on new or old pipe, or old joints on new or old pipe, you get a safe, sure tool joint-to-pipe connection every time.

*A Hughes extra! The new method of cold-rolling the large land area of "Seal-Grip" drill pipe at the mill — developed by Hughes — greatly strengthens this critical area.

When you specify "Seal-Grip," you get the *strongest* and most *versatile* field replaceable tool joint assembly you can buy!

HARDFACING IN DEPTH — a development of Hughes — is also available on "Seal-Grip" joints.

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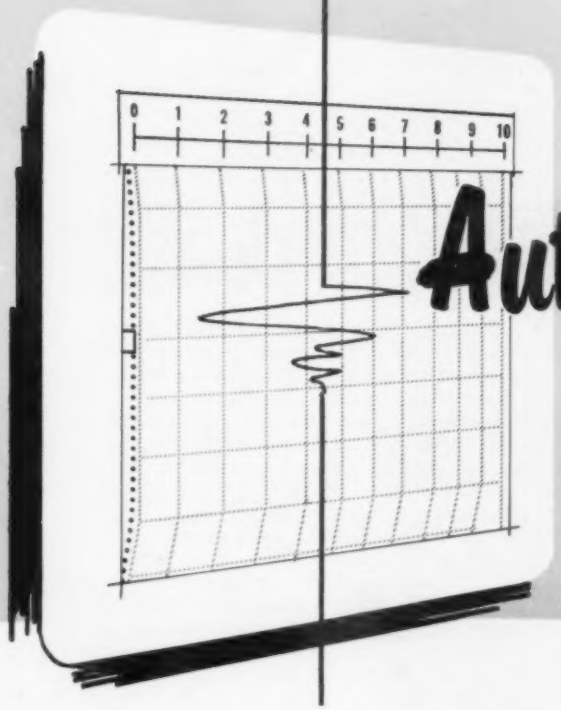


Automatic Stream Analyzers...

By D. J. Fraade
Process Instrumentation Engineer,
Consolidated Electrodynamics Corp., Pasadena, Calif.

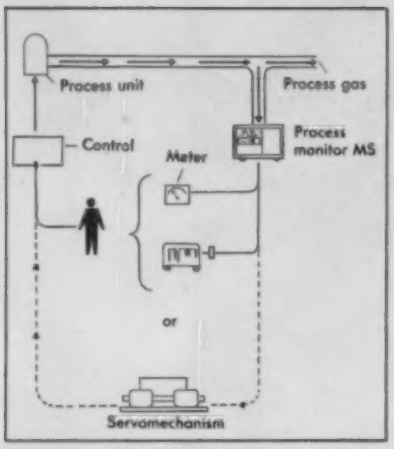
PROCESS PLANTS are built to produce specific products of a guaranteed quality at a maximum yield. These function through control of temperature, pressure, flow, and level to obtain the desired quantity and quality of end product. This is based on constant conditions. But in actual operation feed-stock composition may change, catalyst strength decreases, impurities accumulate, etc. These will all contribute to an end product that is "off spec" as to quantity and quality. And the operator may know only after a lapse of time that his product is off, since samples of the material must first be taken, then sent to the analytical laboratory, and the results finally sent back to the operator. During this time off-spec product is being made.

However, this situation is changing with the development of continuous process-stream analyzers. These instruments continually monitor the operation and detect changes as they occur, allowing adjustments to be made to controllers to correct for these changes. The robot plant of the future will be supervised by controlling analytical instruments. The manufacturers producing stream analyzers today are improving these instruments to meet not only today's requirements but to be ready when the future acceptance of these will make their controlling feature an integral part of the design.

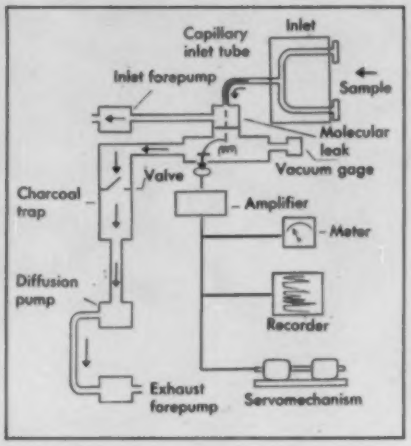
In their basic form today, these instruments are industrial variations of the sensitive laboratory instruments. Their use in continuous plant operations requires careful thought to their application in critical places in the process. To insure this correct application all phases of the process must be carefully investigated. Other aspects requiring this same diligent attention are the sampling problem (pressure reducing, cooling, drying, etc.), complete process information, attendant utility supply (clean water, sampling gases, constant power), and the services of well-trained maintenance personnel.

In recent years process research in chemical process industries has stressed the incremental improvement of product yield and quality. This has been based upon the increased severity in specifications covering quality and purity which, in turn, resulted from growing cost competition.

Initially, the cost of an analyzer is high. But large savings are possible in the application of analyzers. The initial cost of the analyzer was paid for 11 times over the first year that a continuous recording viscosimeter was installed to control the product of a vaccum tower to a desired viscosity specification. In another instance payout of the instrument cost was completed in less than 6 months on savings realized from reduction in isobutane losses. Again, in a sulfur-recovery



THE MASS SPECTROMETER can be made an integral part of process control. Fig. 1.



FLOW SHEET shows how the mass spectrometer fits into the process. Fig. 2.

unit of 30-40 tons per day the cost of a mass-spectrometer type of analyzer was paid for in a year's time as a result of a 3 per cent increase in daily product recovery yield.

From the standpoint of safety, continuous stream analysis offers the best guarantee of savings through protection of personnel and equipment. One of the main causes of last year's Standard of Indiana disaster was the "accidental but unrecognized leakage of oxygen into the recycle gas system." A stream analyzer will now most certainly be installed in this system to monitor the amount of oxygen and to give warning when the concentration of oxygen becomes excessive. Another such application from this safety standpoint is the monitoring of the flue-gas streams from regenerators in catalytic cracking units. These plants produce a vapor with carbon monoxide concentrations. Often a special CO boiler is incorporated in the design to utilize the sensible heat in this stream by mixing the CO with air and burning the mixture. The CO turns to CO_2 as steam is generated by the heat of reaction. A monitoring analyzer is installed in the flue-gas discharge from the boiler in order to insure that the conversion from the lethal CO to the harmless CO_2 has been satisfactory.

With proper forethought and attention to all of the details involved, the use of stream analyzers will result in increased production, higher yields, less product spoilage, and altogether more profitable and safer operations.

Applications

Some of the more standard applications of process stream analyzers are:

1. **On inlet feed streams:** Upon changes in their composition the operator can vary their flow, the flow of inlet air, steam, or other material feeds to maintain the process balance reacting components. This application could be used for gas-steam ratio control on the feed of a reformer-type ammonia plant.

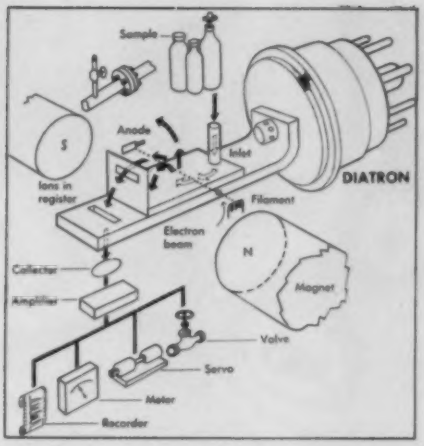
2. **On the outlet of absorbing or scrubbing systems.** To detect their failure to remove contaminating materials which if allowed to continue in the process could poison process catalysts or produce a contaminated product. The corrective action applied usually would be to recirculate the process stream for further treatment or to increase the flow of treating material. This application has been used on carbon dioxide and carbon monoxide removal systems where monoethanol amine and copper ammonium acetate solutions are the scrubbing mediums.

3 **On reaction systems to show a dangerous concentration of reactants which could explode or cause the reaction to run away:** Here the flow of reactants could be varied to correct the condition or the process could be flooded with a quench or inert blanket to stop the reaction. This is one of the first analyzer applications and was used on the ethyl benzene-to-styrene step in a wartime styrene plant of the synthetic-rubber program.

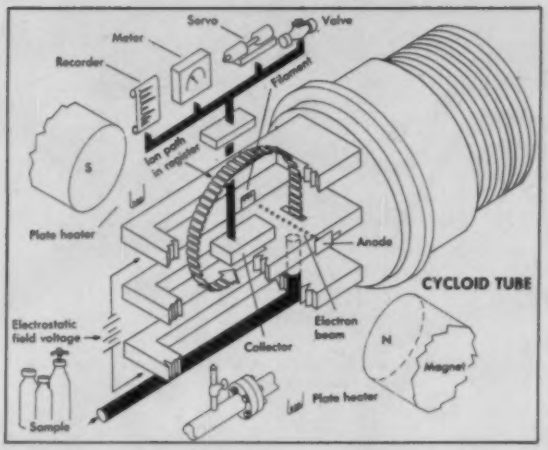
4. **On the outlet of reaction systems to show a change in activity of the catalyst:** This can usually be compensated for by adjusting the reaction pressure or temperature until catalyst has declined in activity so that it must be replaced or reactivated. Analyzers for this purpose have been installed on the circulating stream of the ammonia reactors in ammonia plants.

5. **On the circulating process stream in a reaction system to show the accumulation of inerts:** The usual corrective action is to bleed off inerts at a controlled rate until their concentration is no longer above the acceptable limits. Such an application has also been installed on the circulating stream of the ammonia reactors in ammonia plants.

6. **On product stream to detect off-specification product:** Here it is possible to detect the trend of the product going off specification and by making the correct adjustments to the process controllers the operator can prevent this. In the event the operator is unable to prevent the product from going off specification he can divert the flow from product storage to an off-specification product holding tank to prevent the contamination of acceptable product until the process has been corrected. The off-specification product can be held for repurification and recovery or ultimate disposal. This has been used on a super-fractionator producing high-purity hydrocarbons such as a pentane fractionator producing 95 per cent isopentane.



MINIATURIZED VERSION of a conventional 180° mass spectrometer. It has a mass range of 2 to 40. Fig. 3.



ADDITIONAL ELECTROSTATIC FIELD over the instrument shown in Fig. 3 is illustrated here. Otherwise, ion separation is similar. Fig. 4.

7. **On plant atmospheres to detect toxic or explosive conditions:** In this case the analyzer usually will not make any changes in process conditions but will sound alarms, start blowers, or take other precautions to protect personnel and equipment. This has been used on methanol plants to detect and warn of the presence of carbon monoxide.

This report deals with true continuous process stream instruments. These must be ruggedly built to stand 24-hour operation out in the yard of a chemical-process operation plant. Also, it must be suitably housed to meet all code requirements for operation in a hazardous atmosphere, as well as to withstand unfavorable weather conditions. There are many types of analyzers being sold today that meet these requirements. In addition, the instrument manufacturers are working along with the users to incorporate the latter's special requirements. Most of today's analyzers, therefore, offer the "building block" or module construction which provides the maximum flexibility in application.

Plug in . . . By featuring the "plug-in" type of components, for example, a user can more easily adjust the instrument to his changing operating needs as they arise. He can purchase a suitable analyzer for monitoring only in the beginning and then as he learns more about his process, he can purchase and easily tie in the components to make his analyzer a controlling type, thereby achieving "closed-loop" instrumentation.

The remainder of this report is devoted to a number of commonly used continuous process-stream analyzers, arbitrarily chosen from an imposing and ever-growing list.

There are other more simple types of instruments which can be classified as end-point analyzers. These can be used to determine solution strengths, concentrations of residuum in tower bottoms, process contamination, blanketing atmosphere conditions, etc. Some of the product-specification parameters measured by these analyzers are liquid and gas specific gravity, gas dew point, liquid turbidity and viscosity, vapor pressure, partial pressure, boiling-point rise of solutions, etc.

Types of Analyzers

1. Mass spectrometry
2. Infrared
3. Refractometry
4. Viscosity
5. Gas chromatography

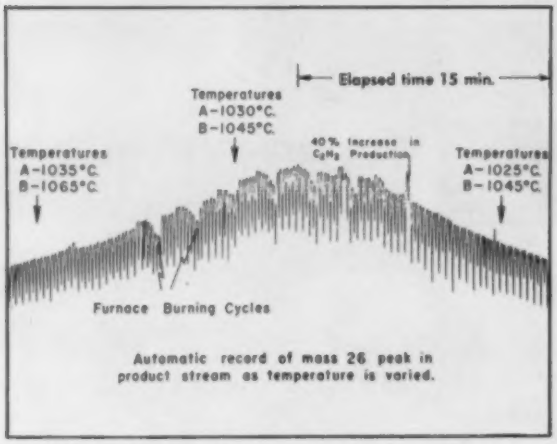
To this list might be added flow colorimetry and moisture analyzers though lack of space will prevent discussing those in this report.

1. **MASS SPECTROMETRY.** This is perhaps the most versatile tool of all stream analyzers. The outstanding advantage of mass spectrometry is its ability to analyze gases and liquids more rapidly than other methods. The mass spectrometer is not limited to particular compounds or any particular concentration range. Operation is simple and multicomponent samples of varied types can be analyzed accurately and rapidly by nonprofessional personnel. In plant control and research laboratories the mass spectrometer is employed to analyze individual samples as small as 0.1 standard cc. of gas or 0.001 cc. of liquid.

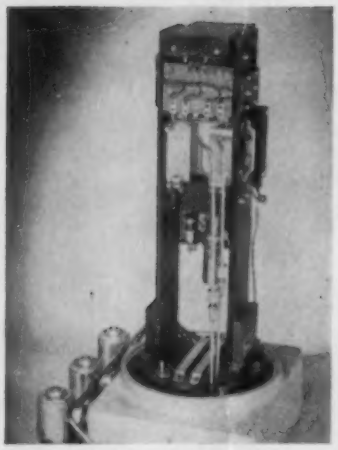
As a process monitor, the same spectrometer is located in the plant proper and the sample is led in directly from the process stream. Fig. 1 shows how such an installation becomes an integral part of the process. Deviations from optimum plant operation are reflected almost instantly as a recorded change in sample composition. *(See the accompanying article for more detail on process mass spectrometers, page 93.)*

All mass-spectrometer analysis is accomplished by bombarding an extremely small amount of sample vapor with an electron beam. The resulting charged molecular fragments or ions are then sorted electromagnetically and the relative abundance of ions appears as an electrical output from the analyzer. Recording this output provides a means of qualitative and quantitative analysis.

Fig. 2 is a schematic presentation of operation. The sample gas is fed into the instrument through the connection on the right-hand side. It passes through the



A SMALL CHANGE in optimum temperature results in 40 per cent decrease in acetylene yield. Mass-spectrometer record shows this clearly. Fig. 5.



INFRARED ANALYZER with cover removed. Energy sources and resolution devices are shown. Fig. 6.

inlet block and is then vented. Only a small portion (less than 1 cc./sec.) of the gas flowing through the inlet block is drawn in through the capillary inlet tube. The design of the capillary inlet tube and the pumping speed of the inlet forepump are such that a 1-mm. Hg pressure is maintained above the molecular leak at all times. Only that portion of the sample which passes through the small holes in the molecular leak is actually analyzed.

Figs. 3 and 4 show the details of one manufacturer's mass-spectrometer product line. Fig. 3 shows a miniaturized version of a conventional 180° mass spectrometer. It has a mass range from mass 2 to mass 40. With this instrument analyses can be performed on samples containing any compound whose molecular weight is 40 or less. In many cases, this range can be extended to molecular weights as high as 80 when unit mass resolution is not a requisite for the analysis.

Since every compound has a unique arrangement of the atoms within its molecules, the manner in which its molecules break up into charged fragments (ions) when bombarded by a stream of electrons in a mass spectrometer is also unique. This is the basis of a method of detection and analysis.

In Fig. 3, a separation of molecular fragments, or ions, so that they can be individually identified is achieved by electrically accelerating them into a strong magnetic field. Here the different particles travel 180° in distinct curved paths determined by their weight (mass) and velocity. Any desired group of particles can be made to strike a collector target by correct adjustment of the accelerating voltage. This alters the trajectory.

In Fig. 4, separation of ions is accomplished in a similar manner, except that an additional electrostatic field is used. This electrostatic field causes the ion path to follow a cycloidal trajectory. A particular group of ions is made to strike the collector by an adjustment of the electrostatic field. The mass range of 12 to 150 is covered in this manner. The mass range of 2 to 12 is obtained by using an auxiliary, conventional, 180° collector.

Stream Analyzers

In either instrument the collector is connected to a highly stable amplifier which raises the minute electrical signals produced by the impinging ions to a level suitable for direct indication of ion abundance on meters and chart recorders, or for operation of servomechanisms and other control equipment.

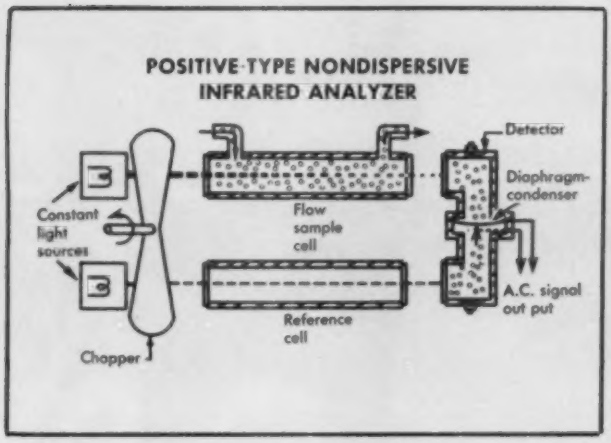
In graphic form, the relative quantities of all ions formed by a substance constitute its "mass spectrum," which serves as a "finger print" for that particular substance. Compounds which produce peaks at the same masses are still identifiable. Since the spectra of all pure substances are different, a complex analysis can be performed by algebraically subtracting these constituent spectra from the spectrum of the mixture. In mixtures each compound behaves independently and the resulting mixture spectrum is the sum or linear superposition of the spectra contributed by its components. Concentrations can be computed either on the basis of peaks unique to the components, or by the solution of simultaneous linear equations.

Some proven applications in continuous process monitoring applications are:

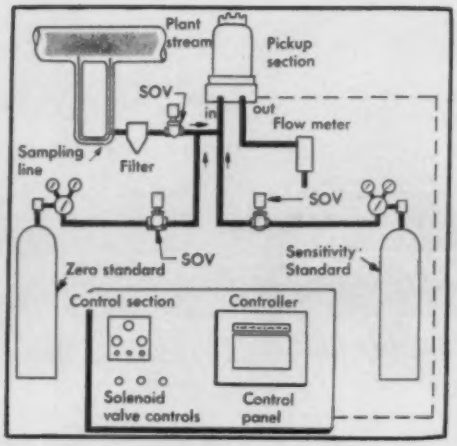
- (a) **Monitoring of trace impurities** is very successful because of the unusually high sensitivity of the mass spectrometers. Continuous sampling provides accurate analysis of easily absorbed or highly reactive trace quantities which might be lost in batch-sampling techniques. Even trace quantities of water vapor in a gaseous stream can be measured continuously by a technique which provides detection thresholds of 30 p.p.m. Thresholds for many other impurity detection problems, such as the determination of oxygen and nitrogen in high-purity argon, are often found to be in the range of less than 10 p.p.m.

- (b) **Sulfur-recovery operations** where H_2S is partially burned with air to form a stream containing two parts hydrogen sulfide and one part sulfur dioxide. *(see accompanying article for more detail.)*

- (c) **Liquid streams** can be analyzed by the addition of either high-temperature or low-pressure liquid stream vaporizers. The higher mass analyzer is generally more applicable to liquid stream analyses. In a petroleum refinery, this mass spectrometer has been used to monitor the liquid product stream of a cat-



INFRARED ANALYZER UNIT contains energy sources, energy-beam chopper, sample cell, reference cell, and two-chambered detector. Fig. 7.



TYPICAL INFRARED installation provides for analyzer at sample site and remote panel. Fig. 8.

alytic reforming unit to continuously measure the reforming efficiency.

• (d) **Production of acetylene.** In the production of acetylene by the Wulff process, light hydrocarbon gases are introduced into a cracking furnace. The yield of acetylene in the furnace product stream is dependent upon the furnace temperature. Monitoring the acetylene, the smaller mass range analyzer not only determines the optimum furnace temperature, but also provides a means of rapidly relocating this temperature with changes in feed-gas composition. From Fig. 5 it is seen that only a 10° C. change from the optimum temperature results in a 40 per cent decrease in acetylene yield. With this type of continuous monitoring it is possible to determine optimum conditions even over such a small temperature range. *(See accompanying article for more detail.)*

2. **INFRARED.** The most commonly used analyzer is the continuous, positive nondispersive, type for monitoring compound or elemental gases. The instrument operates on the principle that heteroatomic gases absorb infrared energy at various wave lengths. It does not disperse the infrared energy into single selected wave lengths but, rather, utilizes all the wave lengths characteristic of the gas being analyzed. The output signal increases with increasing concentrations of the gas to which it is sensitized.

Fig. 7 shows the analyzer unit. It contains two identical infrared energy sources, a motor-driven 10-c.p.s. energy beam chopper, a sample cell, a reference ("dummy") cell and a detector that is divided into two chambers by a diaphragm-condenser.

The detector is sensitized by filling both chambers to the same pressure with the type of gas the instrument is to detect and measure; CO_2, for example.

When infrared energy falls on the detector, the energy will be absorbed only in the region where the sensitizing gas has absorption bands, making the instrument highly selective. The detector remains in balance unless CO_2 is present in the process stream flowing through the sample cell. If CO_2 is present, infrared energy proportional to the concentration will be absorbed and less energy will reach the detector. The diaphragm-condenser will move in response to this pressure unbalance, a radio-frequency voltage across it producing a signal which is amplified to drive a recorder.

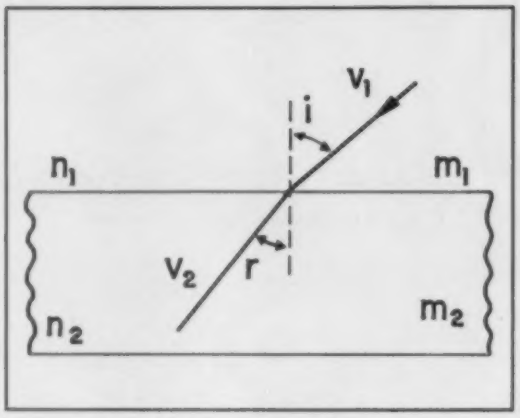
A small hole in the diaphragm equalizes gradual pressure variations due to ambient temperature changes, but does not prevent diaphragm movement in response to the 10-cycle pressure pulses. The a.c. signal produced by the pressure pulses permits use of a stable, drift-free amplifier.

The housing is a rugged, easily removed, explosion-proof container for vertical or horizontal mounting as close to the process stream as temperature and space conditions allow. The resulting short sample line enables faster over-all response to changes in the measured variable.

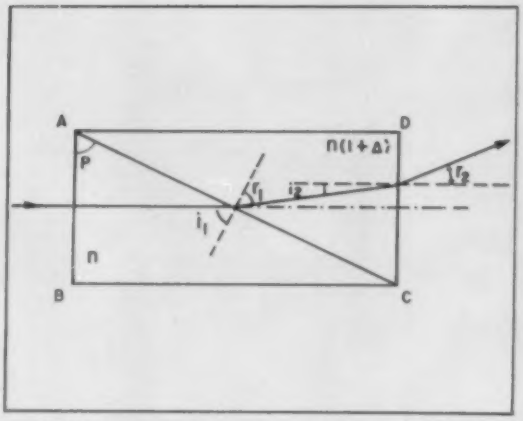
Fig. 6 shows the analyzer with the cover removed. Inside the housing are the infrared energy sources, filter, detector cells, light-beam chopper, radiofrequency oscillator, and a thermostat-controlled heater.

Fig. 8 is a schematic diagram of a typical installation. The control panel-amplifier unit can be located as far as 600 ft. from the analyzer unit. It is a rack-mounted electronic unit. It includes the system power switch and zero and sensitivity controls. The standardization panel contains the solenoid-valve controls and may be for manual operation or automatic. The solenoid-operated valves (marked SOV) are integrally mounted and manifolded at the base of the analyzer unit. They control the admission of plant stream gas, zero standard gas, and upscale standard gas into the detector cells.

3. **REFRACTOMETRY.** Refractive index, like molecular weight, density, boiling point, etc., is a widely accepted specification of a material that can be found in any of the standard handbooks. This fundamental physical property has been a basis of analysis in the control laboratory for a long time. However, it has been only recently that a simple design has been put on the market to make available a true process instrument featuring stability at sensitivities higher than those available in most laboratory instruments; simplicity and ruggedness of construction; low installation and maintenance costs; applicability to a broad



SNELL'S LAW of refraction defines the change in velocity when light rays move from one medium to another. Fig. 9.



DIFFERENTIAL PRISMATIC CELL shows refraction effect in a cell used in a process stream analyzer. Fig. 10.

range of problems; suitable for location and operation in hazardous areas.

A brief review of refractometry fundamentals shows that light passing through any medium travels at a velocity dependent upon the medium. When passing from one medium to another along a line oblique to the interface, the light is "bent" or refracted because of the difference in velocities. Fig. 9 presents Snell's Law of Refraction. A ray of light originating in M_1 (having a refractive index of n_1) is obliquely incident at a velocity v_1 and at an angle i. Due to the refraction phenomena, the ray continues in M_2 at a velocity v_2 and at an angle r with the normal. The relative refractive index of M_1 is defined as:

$$\frac{n_2}{n_1} = \frac{\sin i}{\sin r} = \frac{v_1}{v_2}$$

The reference material most commonly used in air, which then can be arbitrarily defined as having a refractive index of unity.

$$\text{Refractive index (R.I.)} = n = \frac{\sin i}{\sin r}$$

The range of refractive index from 1.30000 to 1.70000 encompasses most liquids commonly encountered.

The factors most strongly affecting refractive index are the temperature of the material and the wave length of the incident light. To a considerably lesser extent, pressure has an effect. Refractive index and the density of the material are also closely interrelated; the higher the density, the lower the R.I. and the higher the pressure, the higher the R.I.

Fig. 10 shows the refraction effect in a differential-prismatic cell, such as is most commonly used in instruments employing the principle of refractometry for continuous process-stream analysis.

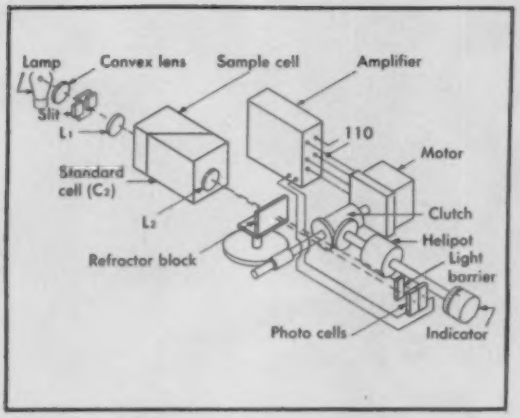
Collimated light is incident normally on AB, the entrance window of the first half of the differential cell. This half is filled with the reference liquid having a known refractive index value of n. No refraction takes place at AB because of the normal incidence. The light then passes on through until it strikes AC, the interface between the two cells, at an angle i_1 which is equal to angle P, the cell angle. The light beam then passes into the cell containing the unknown. If the unknown has the same R.I. as the reference, the light will continue undeviated as indicated by the dot-and-dash line. However, if the unknown (process sample) has an R.I. different from the reference (standard), the light will be deviated as shown. In the figure it is assumed that the R.I. is higher and has a value = $n(1+\Delta)$.

Use of the differential cell affords a means of greatly reducing the effects of temperature, pressure, and spectral purity. Since the liquids in the two adjacent cells are very similar, they have similar temperature and pressure coefficients, as well as dispersive properties. Accuracy is maintained as long as the **differences** in the pressure and temperature of the two cells are kept below the tolerance values imposed by the detectability requirements of the analysis. Basically, it is much simpler to maintain constancy of relative rather than absolute values of pressure and temperature.

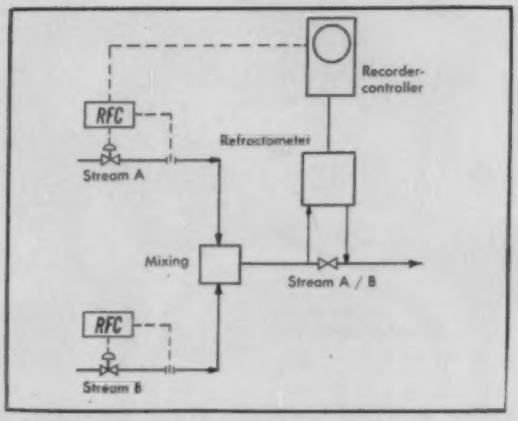
Because of the similarity of the liquids in the two cells, the dispersion effect is essentially canceled. Therefore, a source of white light such as an incandescent bulb can be used. Such a source is much simpler and more reliable than a monochromatic one.

DIFFERENTIAL refractometer for process use. It is simple, rugged, explosionproof, and easily maintained. Fig. 11.

Stream Analyzers



OPERATING procedure for differential refractometer calls for light to pass through sample and standard cells, and then to indicator. Fig. 12.



BLENDING OF TWO STREAMS may be controlled with the differential refractometer. The instrument resets the flow controller on stream A. Fig. 14.

Light from an incandescent lamp collimated by a slit-and-lens system traverses the liquid prism cells (C_1 and C_2) where the beam is bent in proportion to the refractive index. The beam is focused by lens L_2 and then redirected toward two photocells by a refractor block mounted on a turntable which is positioned by the servomotor. The beam is split into two parts by a light barrier just before reaching the photocells.

At balance, the image of the slit is evenly divided so that each photocell receives an equal amount of light. When the refractive index of the liquid sample in prism C_2 changes, a greater amount of light will fall on one of the photocells. Since the photocells are electrically connected in opposition, the amplified difference signal will drive the refractor-block positioning motor until light falls equally on both photocells, thus restoring balance.

Hollow prism cell C_1 contains a standard liquid sample and cell C_2 contains the flowing process sample. When both samples have the same index of refraction, there is no deviation of the light beam as it passes through the two liquids. Composition changes in the flowing sample deflect the beam in proportion to the refractive-index difference of the sample and standard. Deviation of the beam causes one photocell to receive more light than the other.

The resulting signal to the amplifier starts the motor which turns the refractor block toward a balanced condition. The displacement of the refractor block required to achieve balance is proportional to the difference in refractive index between sample and standard. Position of the refractor block is shown on a dial geared to the motor shaft. A Helipot is also geared to the motor shaft to operate a potentiometric recorder.

Fig. 11 is a process version of the differential refractometer, clearly revealing its simple, rugged construction and the explosionproof housing which is easily removed for inspection of electronic and optical assemblies.

Fig. 12 diagrams the operating procedure. Fig. 13 shows the components with the bell housing removed.

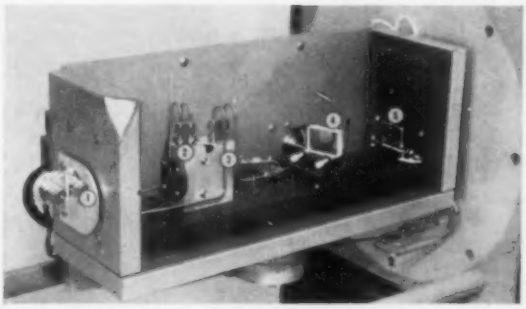
Some applications of the process differential refractometer are:

(a) **Alcohol-water analyses.** Water has an R.I. of 1.33299, while the values for methanol, ethanol, and isopropyl alcohol are 1.32920, 1.36176, and 1.37757 respectively. At maximum sensitivity (each division being equal to 0.000012 R.I.), it is thus possible to detect changes of 1.3, 0.04, and 0.03 per cent respectively.

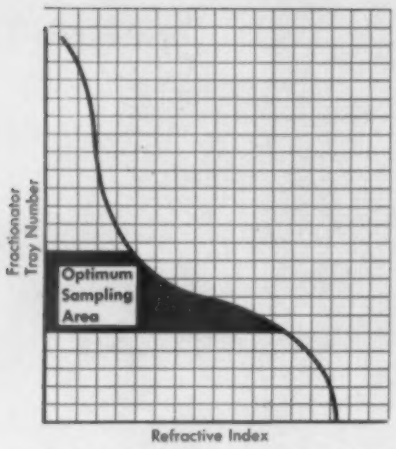
(b) **Separation of styrene and ethylbenzene.** The expansion in synthetic-rubber production makes this analyzer more important in achieving close quality control. The R.I. of styrene is 1.543 and that of ethylbenzene is 1.498. Therefore, a change of 0.03 per cent can be detected.

(c) **Control of blending of two streams.** An example of such an application is the blending of styrene and butadiene involved in the aforementioned manufacture of synthetic rubber. The respective indexes of styrene and butadiene are approximately 1.5434 and 1.4120. At medium sensitivity, a change of 0.1 per cent is easily detectable. Fig. 14 shows such a system A sample of correctly blended liquid is "locked in" the reference cell and a portion of the unknown blended liquid flows through the sample cell. Variations in refractive index from the standard are recorded and used to activate a pneumatic controller. A valve in one of the main feed lines is positioned by the pneumatic controller to maintain the desired blend.

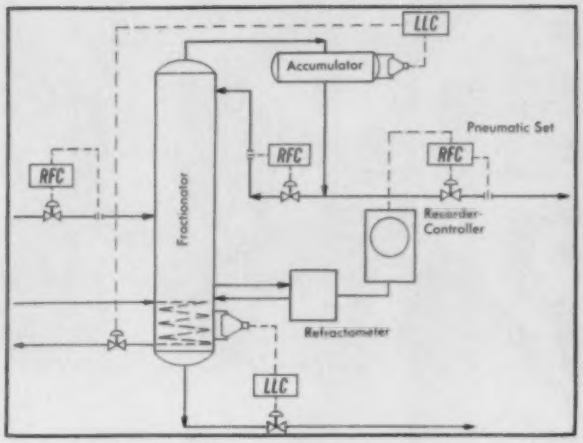
(d) **Fractionator column measurement and con-**



REFRACTOMETER COMPONENTS include: (1) light source, (2) standard cell, (3) sample cell, (4) refractor block, and (5) photocells. Fig. 13.



OPTIMUM SAMPLING POINT is found when refractive index is plotted against tray number. Fig. 15.



FRACTIONATOR CONTROL may be improved by use of the differential refractometer. The instrument in this case resets the product-stream flow. Fig. 16.

trol. The optimum sampling point is found by taking samples from various trays in the fractionator column and plotting refractive index vs. tray number. Fig. 15 shows the graph for a typical plot. For maximum sensitivity, the sample for the refractometer is taken from a tray in the area of greatest refractive index change (shaded area on graph). Correlation of end-product refractive-index changes with variations at the sampling point is easily made by sample analysis of the end product during a period of optimum operation. This method of sampling using the optimum sampling point permits an effective increase in sensitivity without additional burden on the instrument. It is sometimes used when the impurity in the end product is too small for accurate measurement.

After the sampling point has been chosen, the standard cell is filled with a "locked-in" sample representing optimum composition of the mixture at the sample point.

The process refractometer then continuously measures and records refractive-index difference between actual composition and desired composition at the sample point.

For "closed-loop" automatic control through a feedback system, this instrument is equally applicable. Fig. 16 is an example of such automatic control applied to a fractionator column. Deviation from the desired refractive index actuates a pneumatic controller which varies the set point of a flow controller in the overhead takeoff line. Changes in rate of takeoff cause a liquid-level controller in the overhead accumulator to vary the heat input to the system, which in turn causes a change in composition at the sampling point.

Improvement by use of automatic control is shown on the "off control" and "on control" recorder charts shown in Fig. 17. The off control chart was obtained by disconnecting the process refractometer from the control loop for a 24-hour period and recording refractive-index deviations while the process was operated with only the help of conventional temperature-pressure-flow controllers. The on control chart was obtained on the same fractionating column by use of the automatic control system described above. Full-scale sensitivity of the instrument in both instances was 0.0100 R.I. units.

The automatic control system maintained sample-point composition within ±0.0003 R.I. units of the desired value. These records were obtained from a fractionator separating cyclohexane and methylcyclopentane from normal hexane. Other typical monitoring and control applications for the process refractometer include separation of styrene from ethylbenzene and recovery of pure compounds from natural gasoline.

4. **VISCOSITY.** The physical property of viscosity is one of the most widely used parameters in end-point control for the determination of specification product. Fig. 18 shows the principle of operation of one system. The piston rod is periodically raised by an air or electric motor-operated lifting mechanism, thereby drawing a sample into the measuring tube. The sample travels on down through the clearance between the piston and the inside of the tube, and on into the space which is formed below the piston as it is raised.

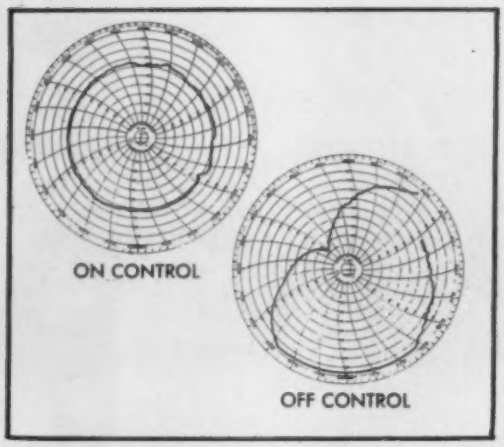
The piston assembly is then allowed to fall by gravity, thereby expelling the sample out through the same path as it entered. The time of fall is a measure of viscosity, with the clearance between the piston and the inside of the tube forming the measuring orifice. The measurements are used in conjunction with other conventional receiving equipment to record and/or control the viscosity. This principle provides high sensitivity and repeatability with a simple and rugged design, affording easy maintenance. The normal rise and fall movement of the piston provides continuous self-cleaning.

Fig. 19 shows the detailed components of the measuring assembly. It can be made explosionproof by making the timing-switch housing in accordance with code requirements for operation of arcing devices in hazardous atmospheres.

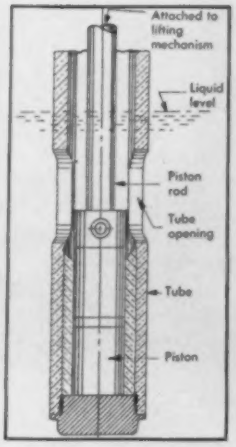
Fig. 20 shows an enlarged view of the head with the cover removed.

Some typical applications for viscosity measurement and control are:

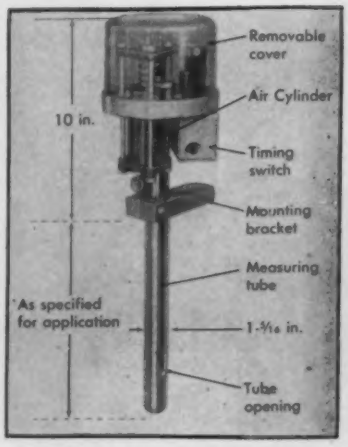
(a) End-point determination, where viscosity is automatically recorded during polymerization and other



CONTROL IMPROVEMENT when using the differential refractometer is shown here. "Off control" is record when instrument was not used. Fig. 17.



OPERATING principle for continuous viscosimeter controller. Fig. 18.



PROCESS VISCOSIMETER is made explosionproof by careful construction of timing-switch housing. Fig. 19.

chemical processes. All changes are shown as they occur so that the process can be terminated at that correct viscosity resulting in specification product.

(b) **Petroleum processes,** where viscosity of final refined product and blending operations is the major criterion of quality control.

The viscosity range of such an instrument is 0.1 to 1,000,000 cp. Models are available for operating temperatures as high as 600° F. For automatic control, electric systems provide ON-OFF with 1, 2, or 3 adjustable switch points for control and both visual and audible alarms. For pneumatic systems there is ON-OFF, along with all types of proportioning action.

5. **VAPOR-PHASE CHROMATOGRAPHY.** Widely heralded only a short while ago as a revolutionary new tool for research and analytical laboratories, this type of analyzer is now universally accepted as a quick, reliable means of performing routine and exploratory analyses of gases and volatile liquids. Today, there are only a few true process versions available commercially.

Gas chromatography is the separation and measurement of the components of a mixture by passing the mixture through a column in a stream of gas. Because different equilibria exist between the mobile phase (carrier gas and sample) and the stationary phase (the column material), the components will separate according to their individual equilibrium constants.

To put it perhaps more simply, each component in a mixture has its own "affinity" for a given column material. Therefore, it will cling to that material for a time characteristic to it alone and to no other component. The time during which it clings to the column before it is driven out by the carrier gas is called the retention time. At a given temperature, flow rate, and sample volume—and with the same column material, column size and carrier gas—a component will always have the same retention time.

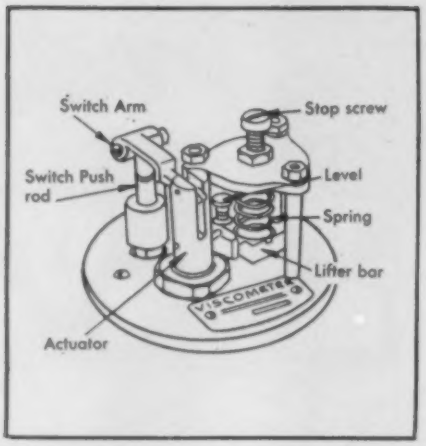
Since each component has its own "clingability" or retention coefficient for a given column material, it will stay a longer or shorter time in the column than other components in the mixture. Eventually, all components will be driven out, one by one, by the carrier gas. As each component emerges, a sensing device (usually a thermal-conductivity cell) measures its concentration. The result is a series of symmetrical peaks on the recorder-receiver. The position of the peak along the ordinate, or time axis, is the qualitative value (the time the component first appeared at the detector and how long it took to come out). The area of the peak, or the abscissa value, is a measure of its concentration in the mixture.

The instrument discussed uses the elution method of vapor-phase chromatography, whereby a fixed sample of gas is introduced into a carrier-gas stream (i.e., helium). The sample is transported into the top of a chromatographic column and washed through by the continuous flow of carrier gas. Since components in the sample will travel through the column packing at a rate dependent on individual physical properties, each component will emerge from the bottom of the column at a different time. As each component emerges, its concentration in the carrier stream is measured by a thermal-conductivity cell and is indicated on a recorder as a peak.

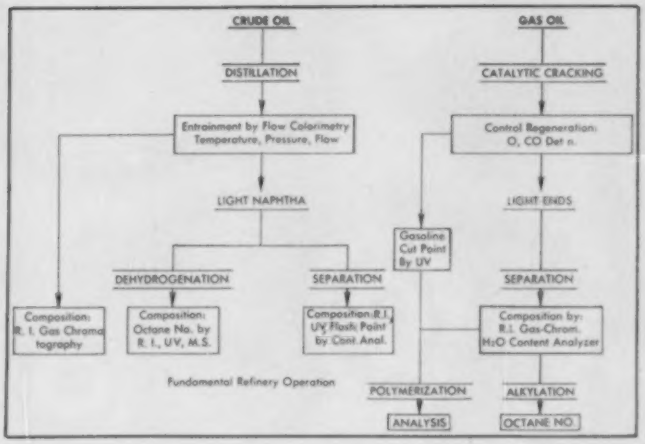
Since, by its very nature, chromatography functions on a batch-process principle rather than on a continuous-analysis basis, it is important that a process chromatograph provide repeat analyses on a preset cycle. The process chromatograph is exceptionally versatile and features the following advantages over the various types of continuous monitoring instruments; extreme ruggedness, unusual reliability, ease of service and maintenance, and intrinsic simplicity of design.

The ability of the analyzer to maintain constant operating parameters such as column temperature, carrier flow rate, sample size, and voltage to the thermal conductivity cells assures **precise reproducibility** of a given component concentration. Thus, peak height in recorder divisions becomes a simple measure of component concentration. Also, since peak height is linear with concentration over a reasonable range, conversion of reading to mole per cent by the plant operator is merely a matter of using a multiplying factor or reading chart. In many cases, the output can be adjusted to make the recorder read directly in mole per cent when recording a single peak.

Stream Analyzers



VISCOSIMETER COMPONENTS are shown in enlarged view of head, with cover removed. Fig. 20.



STREAM ANALYZERS can be used in a number of places in the typical refinery. This breakdown is by types of application. Fig. 21.

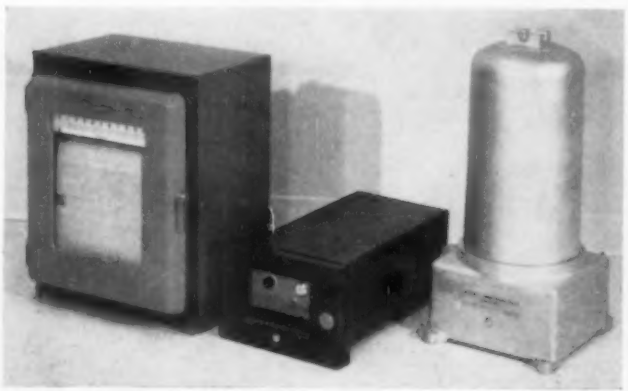
Another advantage of accurately maintaining constant parameters is that component emergence times from the chromatographic column are then **precisely repeatable.** This is important since retention time for each sample in the column—and the time for the column to clear and be ready for a new sample—will depend on the type of sample, column packing, and controllable operating variables. Therefore, with this chromatograph it is possible to program accurately the sampling and recording cycles. This means that only the minimum amount of information required by the plant operator need be recorded (e.g., a single peak for a single key component in a mixture), and the recorder chart can be automatically turned off between readings.

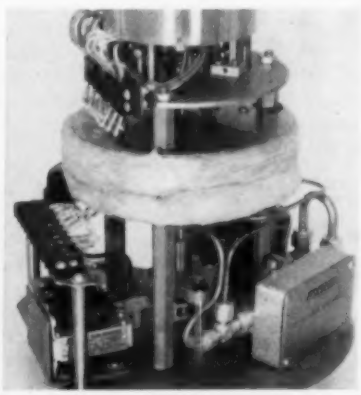
Fig. 22a shows at left the two basic modules of which the chromatograph is comprised. Also shown is a conventional recorder-receiver.

The right-hand unit is the analyzer proper. It is enclosed in an explosionproof housing to meet code requirements for operation in hazardous atmospheres. The analyzer is installed in the plant area in the vicinity of the sampling point. The housing contains the inlet system, column, detectors and flow regulator. Fig. 22b shows the analyzer components with the bell removed.

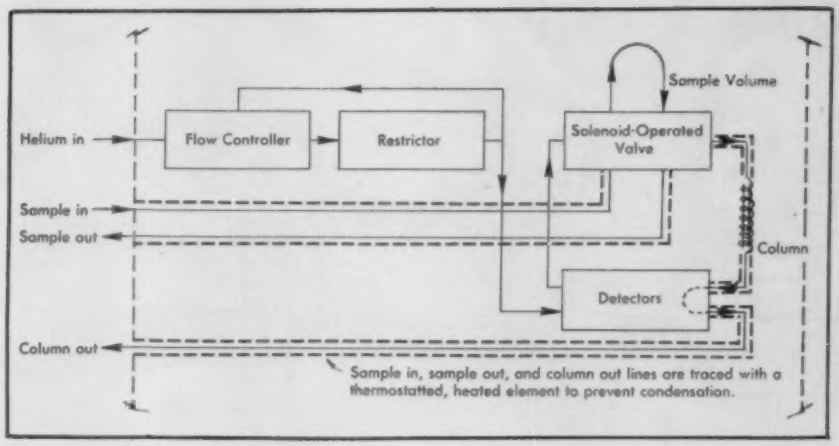
The analyzer consists of two sections mounted inside a cast-aluminum housing suitable for use in Class I, Group D hazardous locations. It is comprised of a coiled chromatograph column (will accommodate any length up to 50 ft. of ¼-in. or ⅜-in. o.d.), solenoid-operated sampling valve, thermal-conductivity cell, carrier gas-flow-regulating mechanism, and all necessary heaters and thermostats. The upper section is composed of the oven for the column, detector, and sampling valves. It is thermostated at either 50°, 100°, or 150° C., as needed, with the temperature held to ±0.5° C. The lower section contains the flow-control system for the carrier gas and the solenoid for the sampling valve. It is thermostated at 50° C. so that the flow can be precisely controlled to ±0.1 per cent.

Fig. 23 diagramatically shows how the sample gas to be analyzed flows continuously through the sampling valve and out to exhaust. When the valve is actuated a metered volume—up to 2.0 ml. of the sample—is injected into the carrier stream. Four external fittings are provided for carrier gas in and out, and sample in and out. All lines from these four fittings to the oven are wrapped and separately thermostated at approximately oven temperature to prevent sample condensation and to provide preheat for the gases. No external meters or controls exist on the analyzer.





PROCESS CHROMATOGRAPH, with two basic modules and recorder-receiver, are shown at left Fig. 22a. Analyzer components are shown at right. Fig. 22b.



SAMPLE GAS to be analyzed in the process chr omatograph flows continuously through the sampling valve and out to exhaust. Fig. 23.

The middle unit is the control cabinet which is designed for remote installation adjacent to the recorder in a central control room.

This unit contains all the electronics, electrical controls, and timing mechanisms required to operate the analyzer and to receive and attenuate the signal from the detector with a regulation of better than 0.05 per cent.

A timing motor and a set of adjustable timing cams make it practicable to set up almost any program desired. One cam times the actuation of the sampling valve, while others time the recording of peaks. For example, it is possible to program the recording of up to four peaks or groups of peaks in a spectrum and discard the rest of the spectrum by turning off the recorder chart drive between peaks. Each peak would have its own preset attenuation factor (x1, x3, x10, or x30).

Also, an automatic polarity reverse is provided for components having a greater thermal conductivity than the carrier gas. A manual switch is provided which overrides the automatic timing mechanism and actuates a solenoid valve near the analyzer for introducing a standard sample. During this period of manual standardization, a normalizing control permits correcting for any slight drift in detector sensitivity which might have occurred.

The cabinet of the control unit can be purged with instrument air or dry nitrogen for installation in Class II locations.

The analyzer and the control unit may be separated by as much as 500 ft., provided adequate cabling is installed.

Some successful applications of separation and analysis are:

(a) H_2, O_2, N_2, CO, CO_2, NO, NO_2, N_2O and trace hydrocarbons in air and nitrogen.

(b) C_1 through C_{10} components, including trace components.

(c) Low boiling alcohols, aldehydes, ethers, esters, amines, amides, and fatty acids.

(d) Saturated and unsaturated compounds such as cyclohexane and cyclohexene, pentanes, and pentenes.

(e) Primary, secondary, and tertiary substituted hydrocarbons.

(f) Aromatic content of catalytically reformed gasoline.

Far from supplanting mass spectrometry, vapor-phase chromatography has emerged as a complementary tool to the mass spectrometer. The former is basically a quantitive instrument, rather than a qualitative one. For analysis, all components must be known or expected. After emergence from the column, the separated narrow fractions can be collected and introduced into the mass spectrometer for further examination.

Conclusion

The petroleum refinery provides a good example of continuous operation. The function of the refinery is to convert crude oil into the finished products required by the market demand in the most efficient and most profitable manner. The refinery, as the manufacturing phase of the oil industry, is important in this discussion, because the applications of process-control analysis to the refining process is most advantageous costwise.

If we consider in general the basic refinery processing, we find it roughly divided into four categories where process control analysis can be utilized. The four categories are Distillation or Fractionation, Conversion or Transformance, Purification, and Blending. Fig. 21 shows such an operation based upon these four categories and indicates the types of process analyzers which are applicable.

Acknowledgments

The following companies were kind enough to permit the use of and, also, to furnish the illustrative material for their analyzers:

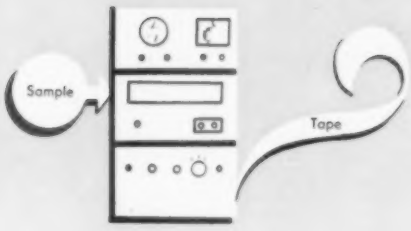
1. Beckman Division, Beckman Instruments, Inc., Fullerton, Calif.: Figure numbers 7, 8, 9, 10, 26, 27, and 28.

2. Consolidated Electrodynamics Corp., Pasadena, Calif.: Figure numbers 1, 2, 3, 4, 5, 6, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 24, 25, 29, 30, 31, and 32.

3. Norcross Corp., Newton, Mass.: Figure numbers 21, 22, and 23.

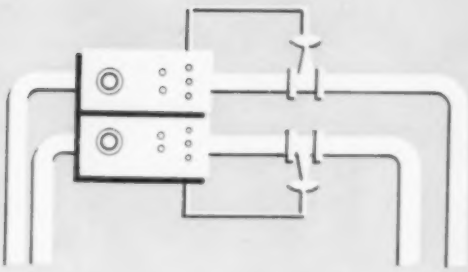
4. Dudenbostel and Priestley, Ind. & Eng. Chem., Nov. 1956: Figure number 33.

COMPOUND ANALYZER



The mass spectrometer is now being used for the analysis of many feed streams, both on batch and continuous bases.

AUTOMATIC SENSING ELEMENT



The process unit shows great promise as a suitable primary automatic sensing unit for the automatic plant of the future.

How the MASS SPECTROMETER

By Henry Landsberg
Consolidated Electrodynamics Corp.

This valuable tool is finding use in a number of applications, including:

- Petroleum production
- Sulfur-recovery plants
- Pilot-plant studies
- Selective absorption
- Ammonia production

PROCESS-TYPE mass spectrometers which have retained the proven versatility of the laboratory models are now being used in a large variety of on-the-line applications.

The instruments are highly adaptable to process application. Complete mass-spectrometer control is technically feasible in many processes.

Laboratory usage . . . For more than a decade, laboratory-type mass spectrometers have demonstrated their ability in making the accurate and rapid analysis of gases and liquids. With only a few exceptions, the mass spectrometer is capable of the analysis of mixtures regardless of the physical or chemical similarity of the individual constituents.

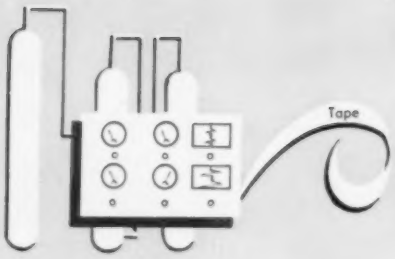
Theoretically, there is no limit to the number of constituents which can be identified in a mixture as long as the sample has the required vapor pressure and constituents do not exceed the mass limit of the particular instrument being used. A sample can be analyzed for either one, or several, or all constituents in a mixture in a matter of several minutes.

Also, the mass spectrometer provides a range of measurement from its lower limit of detection, which in some instances may be as low as several parts per million, up to 100 per cent concentration. Because of these inherent advantages, it is logical that the mass spectrometer should be taken from the confines of the laboratory and developed into an on-the-line instrument.

Plant application . . . In the past 3 years several mass spectrometers designed for plant operation have been introduced.[1 2 3] These instruments are compact, designed for continuous sampling, and are considerably less complex and less expensive than are the laboratory types. The instruments can be programed to analyze continuously for one or more constituents in a stream.

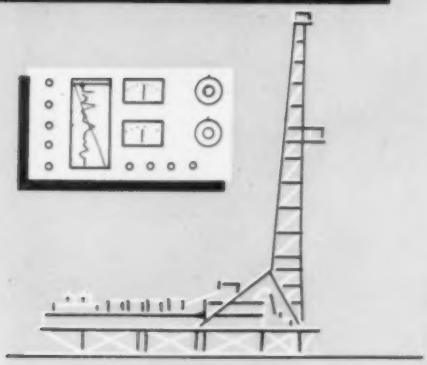
A very significant advantage of the mass spectrometer is that it is not tailored for a particular stream, but can be programed to analyze, on a repetitive cycle, several streams of widely differing compositions. Because of these inherent advantages, the mass spectrometer shows great promise as a suitable primary sensing element in the automatic plant of the future.

PILOT-PLANT MONITOR



The flexibility of the mass spectrometer makes it an especially valuable tool in the study of pilot-plant operations.

FORMATION ANALYZER



During the drilling operation the instrument is used as a means of detecting when a hydrocarbon-bearing zone is reached.

functions in plant and production control . . .

However, until such plants are feasible, the instrument can now be used effectively in monitoring and in some cases even control of many individual processes as demonstrated by applications to be discussed.

The output of the mass spectrometer for a particular component is not a single value, or peak, as it is commonly called, but a spectrum consisting of several peaks, resulting from molecular fragmentation which occurs in the analyzer. Each compound has a unique spectrum consisting of peaks at the mass of its molecule as well as at all masses of the various fragments of its molecule. The magnitude of any one of these peaks, which are in a fixed relation to one another for a particular compound, is a function of concentration.

In a mixture each compound behaves independently and the resulting mixture spectrum is the sum or linear superposition of the spectra contributed by its components.

Unique peak . . . Frequently in a mixture one, or several, or even possibly all components will each yield a peak at a mass number to which the other components do not contribute. Such a peak is referred to as a unique peak. The concentration of a component having a unique peak can be determined by recording that single peak. The recording of that particular peak can be continuous and the sensitivity of the instrument can be adjusted so that recorder deflection can have direct mole per cent significance.

In fact, if desired, this type of signal can be fed directly into a control loop. Measurement of more than one component, each having a unique peak, is likewise simple. In this case the components are successively recorded on a repetitive cycle. Even direct control based on the ratio of two such components can now be accomplished.

When there are no unique peaks available for a particular component, it is necessary to select two or more peaks and determine the concentration mathematically by use of a simple matrix. Concentration of more than one component can likewise be determined.

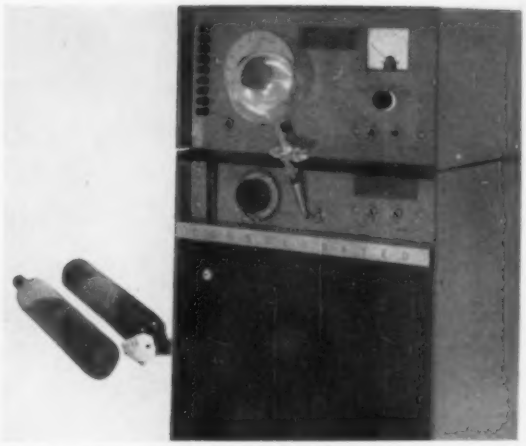
Even though process mass spectrometers have been commercially available for only a few years, they have already proved their value in a number of plant applications. The following specifications have been chosen to illustrate the use of the mass spectrometer in several different types of processes.

In these applications the instruments are generally being used as monitors with operating personnel completing the control loop. However, even at this stage of the art, direct control with the mass spectrometer in some applications is practical and is being considered.

Sulfur-Recovery Plant

A process mass spectrometer has proved its ability to increase appreciably the yield in sulfur-recovery plants. These plants produce elemental sulfur from byproduct hydrogen sulfide extracted from natural and refinery gases[4] (Fig. 5). The H_2S feed gas is introduced into a furnace with enough air to burn one-third of the H_2S to SO_2. The gases then enter the catalytic reactor

PETROLEUM-PRODUCTION OPERATIONS get a boost when a unit is available. This mass spectrometer monitors gas streams from nine wells to check on combustion during the in situ process. Fig. 1.



COMPACTNESS AND SIMPLICITY of process mass spectrometers is illustrated here. This small unit is suitable either for analysis of discrete samples or continuous-stream monitoring. Fig. 2.

where elemental sulfur is formed as illustrated by the equation.

$$2\,H_2S + SO_2 \rightarrow 3\,S + 2\,H_2O$$

It can be seen by the equation that the efficiency of conversion is greatly dependent on maintaining the correct stoichimetric relation of $2H_2S : 1SO_2$. The controlling key to this process is, therefore, the introduction of the proper amount of air. If the feed gas were pure H_2S, then, control could be simply accomplished by ratio flow controllers.

However, the feed gas contains fluctuating amount of CO_2 and hydrocarbon gases. Consequently, correct control can be maintained only by analytically determining the H_2S/SO_2 ratio. Because of the frequency of change, periodic chemical analyses have proved laborious and inadequate. A process mass spectrometer was, therefore, set to measure the H_2S and SO_2 content of the reactor effluent.

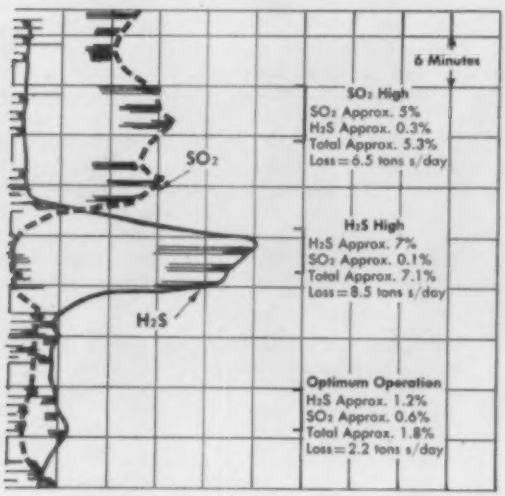
Since the reaction is never complete, the reactor effluent contains some H_2S and SO_2 in a ratio that is indicative of the correctness of the ratio entering the reactor. In addition, the total quantity of H_2S and SO_2 at this point is also indicative of the condition of the reactor catalyst.

The instrument, equipped with an automatic peak selector, was adjusted to record alternately the peaks at mass 34 and 64 which represent the concentrations of H_2S and SO_2 respectively. This illustrates a situation where unique peaks are available for the direct measurement of the components of interest.

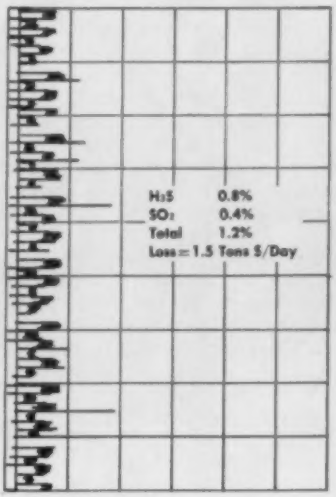
Typical record . . . Fig. 3 shows a portion of a typical record for a plant of moderate capacity being operated normally without referring to the instrument record. What appears as oscillation of the chart record is actually the repetitive scanning of the peak at a slow chart speed.

In the lower portion of the chart it can be seen that the H_2S/SO_2 ratio is correct and the loss due to the incomplete reactions is at the rate of 2.2

UNIQUE PEAKS on a chart can be used for direct measurement. This typical chart record for a sulfur-recovery plant shows optimum operation and two off-specification conditions. Fig. 3.



OPERATION IS SMOOTHED when using instrument as an effluent-gas monitor. Comparison with Fig. 3 shows continuing optimum operation. Fig. 4.



tons of sulfur per day. In the middle portion of the chart the ratio is much too high, indicating a deficiency of furnace air, and the loss is at the rate of 8.5 tons per day. The upper portion of the chart shows that too much air is being added and the ratio is much too low with a resulting loss rate of 6.5 tons per day.

These fluctuations are typical, and the average recoverable loss (that over and above the loss at correct ratio), for a test period of 17 days was 1.3 tons of sulfur per day or approximately 3 per cent of normal plant production. At an average price for sulfur of $30 per ton, this is equivalent to an increase in plant yield amounting to $15,000 per year, excluding any labor savings.

Instrument data . . . Fig. 4 shows a record during which the instrument data was used to operate the plant. It can be seen that the H_2S/SO_2 ratio is being maintained consistently at approximately the correct value of 2 : 1. The sulfur loss during this period was at the rate of 1.5 tons per day. This is less than that shown in Fig. 3 during operation at the correct ratio because of an improvement in the catalyst condition.

In this application the instrument has been used as a monitor with operating personnel completing the control loop. However, a direct closed-loop control system is practical and one is now being produced. The system operates on the basis that while the SO_2 is being recorded, a servomechanism will cause the sensitivity of the instrument to be reset in order to bring the magnitude of that peak to a fixed value.

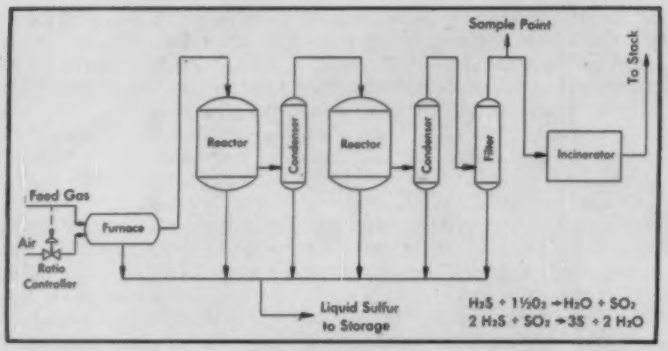
If, then, the H_2S peak is recorded at the same sensitivity, the magnitude of this peak will be indicative of ratio. This signal will then cause the furnace air input control to be reset.

To further illustrate the versatility of a mass spectrometer in the sulfur-recovery process, it was considered necessary in one plant to monitor the incoming feed gas for the hydrocarbon content. Excessive amounts of hydrocarbon will cause a coking of the catalyst and consequential loss of conversion efficiency or even a complete plugging of the catalyst bed. It was determined that mass 27 would be indicative of the concentration of the total hydrocarbons in the feed stream.

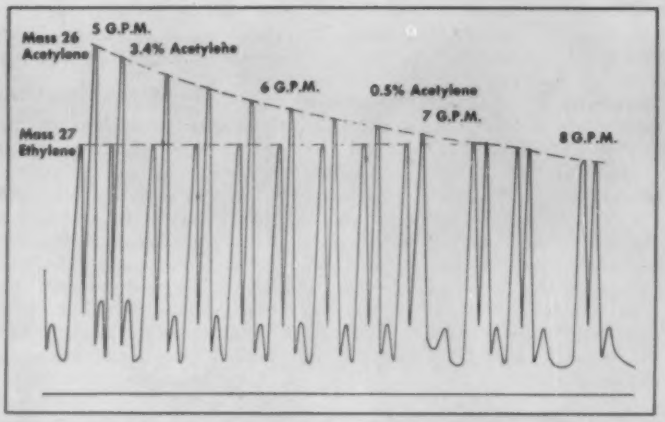
In addition to determining the H_2S/SO_2 ratio in the reactor effluent, the same instrument was programed to periodically check the plant feed for hydrocarbon content.

Ammonia Plant

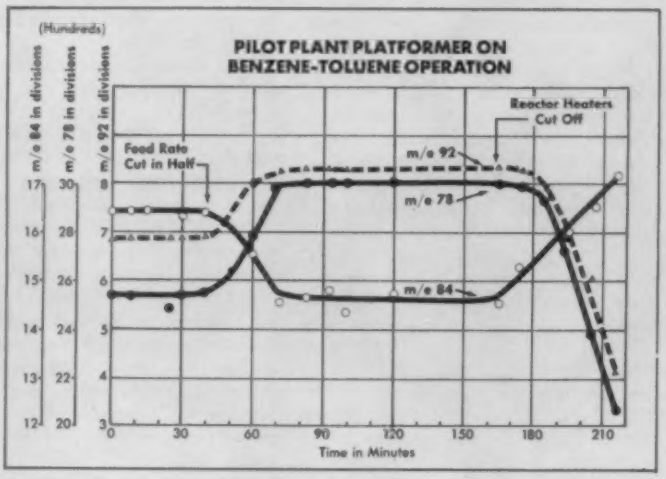
The efficiency of the Haber proc-



SAMPLE POINT in the sulfur-conversion process is downstream from the reactors and past the condenser and filter. Fig. 5.



REPETITIVE SCANNING of an absorber offgas shows peaks at masses 26 and 27 in an acetylene-ethylene plant. Fig. 6.



PILOT-PLANT USE of the mass spectrometer is exemplified here. It monitors repetitively masses 78, 92, and 84, representing benzene, toluene, and the C_6 naphthenes, respectively, in a pilot reforming operation. Fig. 7.

ess for the production of ammonia, like that of the sulfur-recovery process, is greatly dependent on the maintenance of the correct stoichimetric relation of the reacting components. It is essential that a 3 : 1 ratio of H_2/N_2 be maintained in the converter.

In this process the synthesis gas is produced by cracking methane to produce H_2, adding air to increase the nitrogen content, and removing the carbon monoxide and carbon dioxide. The synthesis gas and a recycle of unreacted gas are introduced into a catalytic converter for the conversion to ammonia.

To provide proper control, the H_2/N_2 content in the original feed gas as well as in the recycle gas should be monitored. This is generally done by measuring the hydrogen content with thermal conductivity cells and obtaining the nitrogen content by an involved Orsat analysis.

Monitoring . . . A process mass spectrometer is used to monitor alternately each stream for the hydrogen and nitrogen content. These are simple measurements for the mass spectrometer in that unique peaks are available at masses 2 and 28 respectively, and each measurement can be made in considerably less than 1 minute.

In addition, the flexibility of the mass spectrometer permits checking the recycle stream for argon content at mass 40.

Selective Absorption

Separation by selective absorption is a process technique in which continuous stream analysis can insure optimum operation. A process mass spectrometer has demonstrated its usefulness in maintaining efficient operation of an absorber column by continuous analyses of the absorber offgas in an acetylene-ethylene plant.

The feed gas to the absorber contained, among other constituents, ethylene and acetylene. The absorbing solution will preferentially absorb first the acetylene and then the ethylene. It is desired in this operation to maintain the flow of absorbent so that the maximum amount of acetylene and essentially no ethylene is absorbed.

As shown in Fig. 6, the peaks at masses 26 and 27 were repetitively scanned. It is known from the spectra of ethylene and acetylene that ethylene contributes equally to masses 26 and 27 whereas acetylene contributes only to mass 26. The difference between these two peak heights is, therefore, indicative of the acetylene concentration.

This application illustrates a situation in which two peaks are required in order to determine the concentration of the component of interest. It can be seen on the record that when the absorbent rate of flow was 5 to 6 g.p.m. there was a relatively large loss of acetylene in the offgas. As the rate of absorbent flow was increased from 6 to 7 g.p.m., the loss of acetylene was appreciably decreased. As the rate of absorbent was further increased, the two peak heights began to diminish indicating no loss of acetylene in the offgas but also some absorption of contaminating ethylene.

It follows that in order to obtain optimum absorption at all times the rate of absorbent flow must be matched with acetylene content in the absorber feed gas.

The cracking furnace producing the absorber feed gas in this particular plant is designed not only to produce acetylene, but when desired, ethylene or a mixture of the two.

Petroleum Production

In the production of petroleum, the process-type mass spectrometers are being used in two very important applications. In the drilling operation the instrument is used as a means of detecting when a hydrocarbon-bearing zone is being approached. This is done by continuously monitoring gases which have become dissolved or entrapped in the circulating drilling mud. The gases are continuously eluted from the drilling mud and the mass spectrometer is set to continuously monitor for methane, the most probable hydrocarbon to be first in evidence.

The high sensitivity of the mass spectrometer not only insures against the possibility of unknowingly drilling through a potentially productive zone, but gives sufficient warning of its approach thus enabling effective coring for further study. In addition to this function, the instrument will also give further clues regarding the formation by analyzing for heavier hydrocarbons when the methane content becomes significant.

It has been determined that in many so-called depleted fields as much oil is being left in place as has been withdrawn. A novel method of secondary recovery of heavy oils is being tried in California. This method involves controlled underground combustion by the injection of air in various key wells. The resulting increase in temperature and pressure reduces the viscosity of the oil and permits recovery in the surrounding wells.

The mass spectrometer shown in Fig. 1 is used to monitor the gases from nine wells in order to determine the extent of the combustion process and ensure the injection of the proper amount of air. The instrument is equipped with a nine-point sampling system and a programer which will automatically sample, on a repetitive cycle, the nine wells and record up to six components in each stream.

Pilot-Plant Studies

The flexibility of the mass spectrometer makes it an especially valuable tool in the study of pilot-plant operations. The instrument is able to monitor several key components in the feed and product streams and allow one to study process variables.

A typical study was recently made on a pilot Platforming unit in which C_6 naphthenes are converted to benzene and toluene. The mass spectrometer was set to monitor repetitively masses 78, 92, and 84 representing benzene, toluene, and the C_6 naphthenes, respectively, in the product stream. Fig. 7 shows the peak heights which are indicative of concentration of respective components plotted against time.

After monitoring a steady state for approximately 40 minutes, the feed rate was cut in half. The data indicate that approximately 30 minutes was required to reach a new steady state.

The mass spectrometer shown in Fig. 2 exemplifies the trend in development towards the compactness and simplicity required of process instruments. This small mass spectrometer recently introduced by Consolidated Electrodynamics Corp. is suitable for either the analysis of discrete samples or continuous stream monitoring.[6]

References

1. Robinson, C. F., and Hall, L. G., "A New Development in Process Control Mass Spectrometers," A.S.T.M. E-14 Committee on Mass Spectrometry, New Orleans, Louisiana, May, 1954.

2. Wiley, H. F., "Performance of a New Monitor Mass Spectrometer," Instrument Society of America, Philadelphia, Pa., September, 1954.

3. Donner, W., "A Line Monitor RF Mass Spectrometer," A.S.T.M. E-14 Committee on Mass Spectrometry, Cincinnati, Ohio, May, 1956.

4. Graff, R.A., "Sulfur from Petroleum Gases," The Oil and Gas Journal, reprint Processing Techniques for H_2S Extraction and Sulfur Production.

5. Lanneau, K. P., and Moore, H. F., "Plant Control by Continuous Spectroscopic Analyzers," American Chemical Society, Petroleum Division, Cincinnati, Ohio, March, 1955.

6. Charpentier, D. E., and Gifford, A. P., "A New Simplified Mass Spectrometer," The Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Pittsburgh, Pa., March, 1957.

This paper was presented at joint A.C.S.-A.I.Ch.E. local sections meeting, Beaumont, Tex., 1957.

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		Oil bbls	Water bbls	Gas MCF		
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Pumping	Eastern Kansas	2	492	—	Once a week	.0003¢
Flowing	West Texas	20	6.3	—	Twice a week	.0022¢
Pumping	Northern Kansas	10	70	—	Once a day	.0062¢
Gas Lift	West Texas	20	20	—	Once a day	.028¢
Pumping	North Texas	—	2000	—	Once a day	.0016¢
Pumping	Eastern Kansas	—	250	—	Twice a week	.0011¢
Flowing	East Texas	51	155	1	Once a day	.0028¢
Flowing	West Texas	420	—	—	Twice a week	.0013¢
Gas	East Texas	25	Trace	22.9	Twice a week	.0466¢*
Pumping	West Texas	420	210	—	Every other day	.0014¢
Pumping	West Texas	441	441	—	Every other day	.00052¢
Gas	Northern La.	—	—	23.4	Once a day	.0242¢*
Pumping	Eastern Kansas	—	250	—	Once a day	.0015¢
Pumping	Kansas	100	948	—	Twice a week	.0013¢
Gas	Louisiana	9.2	Trace	300	2 Sticks every other day	.00664¢*
Pumping	East Texas	46	176	0.92	Once a day	.0027¢
Pumping	East Texas	51	155	1.0	Once a day	.0028¢
Pumping	East Texas	20	400	—	Three times a week	.0012¢
Pumping	Eastern Kansas	2.5	276	—	Once a week	.0009¢

*Cost in cents per million cubic feet.

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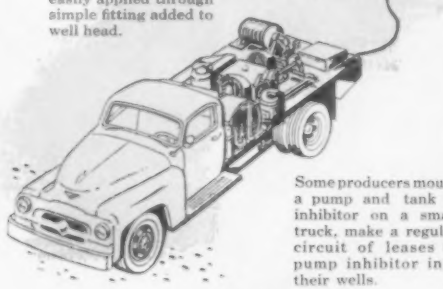

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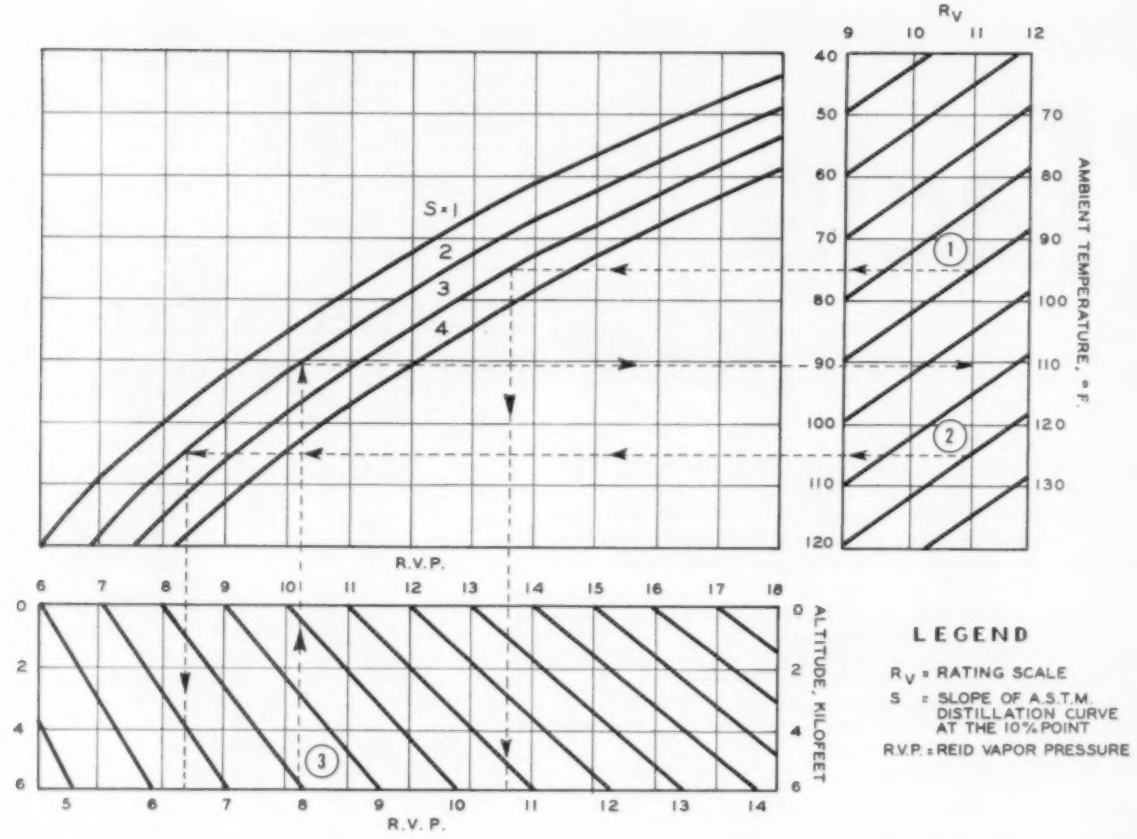

Isovapor-Lock Chart helps refiners

make gasoline blends satisfactorily and economically

Here is a correlation which will enable the refiner to take Reid vapor pressure, slope of the A.S.T.M. distillation curve at the 10 per cent point, ambient temperature, and altitude, into consideration.

The key feature of the method is the rating scale, Rv. Service-station fuels with the same Rv value have comparable vapor-locking tendencies. At a given Rv value, R.v.p. is found from the correlation, based on altitude, ambient temperature, and slope, S.

After thousands of test evaluations, the authors conclude that Rv values of 11 and below are conservative, and that an Rv value much above 12 means that the fuel may cause vapor-lock difficulty.

By T. W. Legatski and O. C. Bridgeman, Phillips Petroleum Co.

MUCH of the available road-test data on vapor lock in automotive vehicles has been obtained under conditions where the ambient temperature is close to 100° F., where the altitude is close to sea level, and where the vehicle operation follows the very severe soak-type procedure. The tiein with fuel characteristics is obtained from Reid vapor pressure and A.S.T.M. distillation data on fuel samples taken from the vehicle at the time of vapor lock.

This type of information is of primary interest to the vehicle designer, since it enables him to evaluate fuel-system quality as regards vapor-locking tendency, and permits him to compare the relative improvements in fuel-system performance as the result of component design changes and of variations in installation details.

In contrast, information of this type is of relatively minor interest to the oil refiner and blender, for a variety of reasons.

Refiner's interest . . . The interest of the gasoline blender lies in those characteristics of fuels which, when supplied to the diverse makes and models of vehicles on the road, will give acceptable freedom from vapor lock under a multiplicity of driving conditions, with due allowance for locality and seasonal effects. Thus vapor-lock data obtained on a few vehicles under conditions of a soak-type test procedure raise several questions:

1. The degree of tolerance to minor deficiencies in vehicle performance on

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the part of the vehicle owner, in comparison to the emphasis placed on these same types of deficiencies in performance on the part of the expert driver in the vapor-lock tests.

2. The difference in driving habits of the vehicle owner and those of the test driver who follows a specified road-test procedure.

3. The extent to which the few vehicles tested should be weighted relative to the multiplicity of makes and models on the road.

4. The difference in fuel characteristics at the time of vapor lock in the road tests and those characteristics of filling-station fuels which give acceptable freedom from vapor lock in customer service.

No simple answers appear to be available for any of these questions.

Road-test corrections . . . The wide discrepancy between "permissible" vapor pressures obtained by vapor-lock tests and the vapor-pressure levels of fuels satisfactorily marketed for these same makes and models of vehicles has resulted in the widespread adoption of the principle of applying a correction to vapor-lock road-test data to bring them into line with commercial marketing practice. Acceptance of this principle automatically eliminates any necessity for special vapor-lock road tests on the part of the oil refiner, since his criterion for acceptable freedom from vapor lock is that established by millions of vehicles driven day after day under diverse operating conditions.

On the other hand, special vapor-lock tests are essential to the vehicle designer for two reasons. First, such tests permit evaluation of fuel-system quality,[1] and evaluation of improvement in performance as the result of design changes. In the second place, the vehicle designer needs advance assurance that his new car model will perform satisfactorily on fuels currently being marketed, with due allowance for upward vapor-pressure trends resulting from economic and octane-number considerations.

Temperature, altitude effects . . . Rational interpretation of the characteristics of motor fuels marketed throughout the country is possible only if means are available for evaluating the effects of ambient temperature and of altitude on vapor-locking tendency. One basic assumption is necessary, namely that vapor lock in any given vehicle is a reproducible phenomenon, and this has been the underlying assumption in all vapor-lock road tests in the past 25 years.

In other words, vapor lock will occur in any given vehicle if the V/L ratio at the fuel-pump inlet exceeds a limiting value determined by the engine speed, the engine fuel demand, and the characteristics of the carburetor, particularly its fuel capacity. The limiting V/L ratio for freedom from vapor lock will vary with different makes and models of vehicles, and with different operating conditions as defined by engine speed and fuel demand. It is purely a mechanical characteristic and is independent of any specific fuel characteristics.

V/L ratio . . . For practical purposes, from the fuel-marketing standpoint, it is necessary to adopt an average or integrated mean value of V/L ratio which can be considered applicable to the diversity of cars on the road. A value of V/L = 30 has been chosen on the basis of detailed studies, (1) of the vapor-lock road-test data obtained over the past 25 years, and (2) of the characteristics of motor fuels marketed throughout the country in the past several years.

Values of V/L = 20 or 25 could be employed without significantly different conclusions, since the isovapor-lock chart is based primarily on the characteristics of fuels being marketed commercially, and these characteristics are not changed by any assumption as regards the reference V/L ratio.

Interpretation of vapor lock in terms of fuel characteristics of comparable vapor-locking tendency necessitates still further definition of the integrated mean fuel system, namely the pressure and the temperature at the fuel-pump inlet. These have been discussed in detail previously,[1] and have been applied to the evaluation of the characteristics of fuels in the tank of the reference vehicle for comparable vapor-locking tendency.

The present innovation lies in the application of these principles to the characteristics of filling-station fuels for comparable vapor-locking tendency. This is based on a comprehensive study of the Ethyl Corp. motor-fuel surveys for the past 2 years, and the details of this analysis will be presented elsewhere.

Rating scale, R_V . . . The key feature of the analysis was the development of a rating scale R_V, which is shown by the vertical lines in the upper right-hand rectangle of the accompanying isovapor-lock chart. Service-station fuels with the same R_V value are considered to have comparable vapor-locking tendencies.

Thus, if $R_V = 11$, comparable fuels at sea-level altitude would be 13.6 R.v.p. at 10 per cent point slope = 3, and at 90° F. ambient; and 8.4 R.v.p. at S = 2 and at 120° F. ambient. (Examples 1 and 2). At 6,000-ft. altitude, the comparable values would be 10.7 R.v.p. and 6.4 R.v.p. respectively. Thus for a selected R_V value, the chart shows the effects of ambient temperature, of altitude, and of 10 per cent point slope, on the R.v.p. value for comparable freedom from vapor lock with any combination of these variables.

Obtaining R_V values . . . The isovapor-lock chart can also be used in reverse to obtain the R_V value corresponding to any given commercial fuel being marketed in a given locality. The altitude at this locality can readily be obtained, but a variety of methods are available for estimating the pertinent ambient temperature. Simplification is obtained if use is made of the highest temperature on record for the given locality and month of sampling, on the assumption that the fuel blender considers the fuel to be satisfactory for the highest expected temperature.

On this basis, as an example, a fuel marketed in Denver during the month of August has an 8.1-psi. R.v.p. and a 10 per cent point slope of 2. The maximum temperature on record is 105° F. during August in Denver and the altitude is 5.29 kilofeet. Hence from the chart, it is seen that $R_V = 11$. (Example 3).

Nationwide sampling . . . Similar evaluations have been made on the fuels reported in the Ethyl Corp. motor-fuel surveys for the past 2 years. Of the 3,423 hot-weather fuels sampled at 52 localities in the U. S., over 53 per cent had R_V values of 9 or higher; over 17 per cent had R_V values of 10 or higher; almost 3 per cent had R_V values of 11 or higher; and about 0.4 per cent of the fuels had R_V values of 12 or higher.

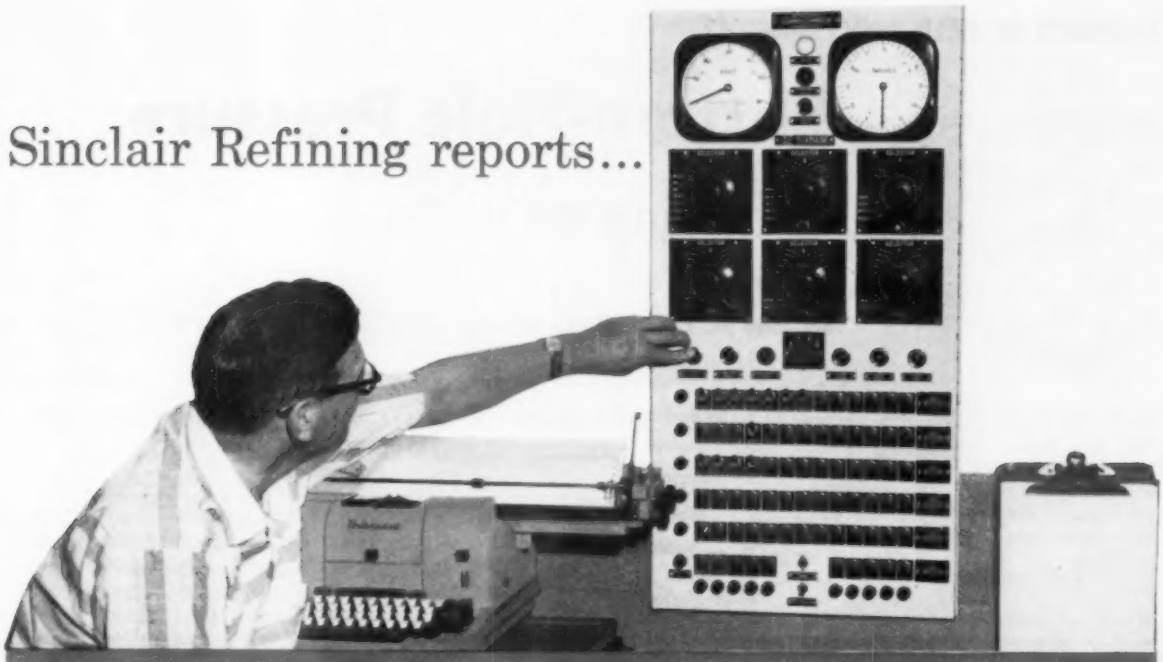
Hence, in using the isovapor-lock chart for estimating safe vapor-pressure limits in different localities at different seasons, an R_V value of 11 is conservative whereas an R_V value much above 12 involves some uncertainty. Values of R_V equal to 10 or lower are ultraconservative, and their occurrence is probably due to lack of availability of high-octane pressurizing components.

In using the chart, after selection of an R_V value having the desired degree of conservatism, assurance of freedom from vapor lock can best be achieved by employing the maximum temperatures on record for each locality.

Reference

1. Fuels and Fuel Systems, Natural Gasoline Association of America, Tulsa, 1955.

Sinclair Refining reports...



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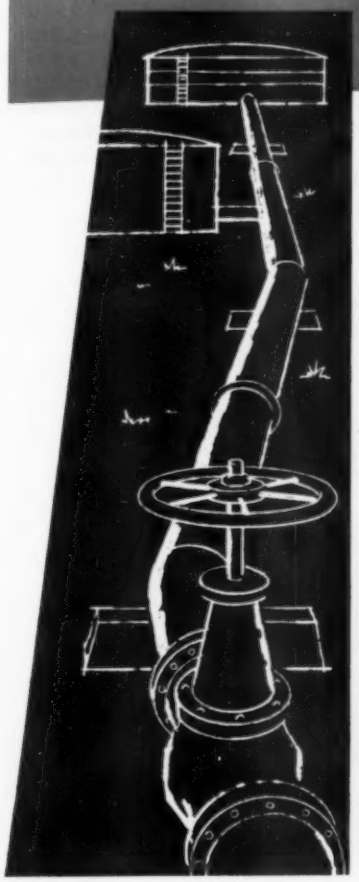

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ELEMENTS OF FIELD PROCESSING—42

How to calculate Bottom-Hole Pressure in flowing oil wells

By John M. Campbell, School of Petroleum Engineering, University of Oklahoma

THE PRESSURE existing in the bottom of a flowing oil well depends on the surface pressure, the head of fluid, and the friction loss. The basic flow equation developed in previous parts may once again be used or:

$$VdP + \Delta h + W_f = 0 \quad (1)$$

If one assumed that the fluid in question is substantially incompressible, Equation 1 resolves very easily into the form below, with suitable sign changes to account for direction of flow, following integration:

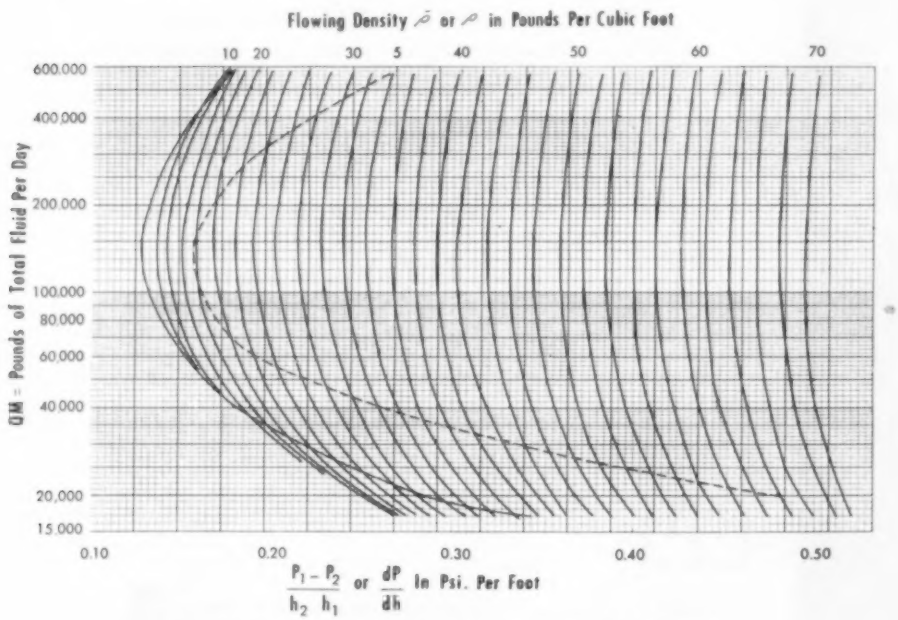
$$\Delta P = \rho h + \rho W_f = P_f - P_w \quad (2)$$

where:

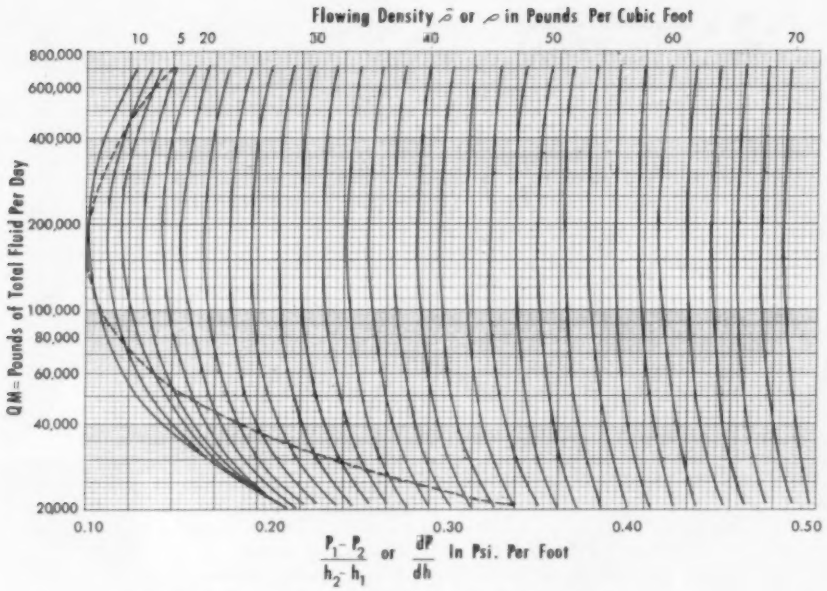
$V = 1/\rho$ = specific volume, cu. ft./lb.
h = depth of producing zone, ft.
ρ = density, lb./cu. ft.
f = friction factor (see Part 28).
P_f = formation pressure, lb./sq. ft.
P_w = wellhead pressure, lb./sq. ft.

TABLE 1—VALUES OF THE INTEGRAL OF ZdP_r, BETWEEN THE LIMITS, 0.2 TO P_r

P_r	T_r 1.05	1.10	1.20	1.40	1.60	1.80	2.00	2.40	2.80
0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.4	0.181	0.184	0.188	0.192	0.195	0.198	0.198	0.199	0.200
0.6	0.347	0.356	0.366	0.380	0.387	0.393	0.395	0.398	0.400
0.8	0.496	0.512	0.536	0.562	0.576	0.586	0.590	0.597	0.600
1.0	0.625	0.654	0.697	0.739	0.762	0.778	0.784	0.795	0.800
1.2	0.728	0.779	0.848	0.912	0.946	0.967	0.978	0.992	1.001
1.4	0.799	0.885	0.989	1.080	1.130	1.160	1.170	1.190	1.200
1.6	0.850	0.971	1.120	1.240	1.300	1.340	1.360	1.390	1.400
1.8	0.901	1.050	1.240	1.400	1.480	1.530	1.550	1.580	1.600
2.0	0.955	1.120	1.360	1.560	1.650	1.710	1.740	1.780	1.800
2.5	1.110	1.310	1.620	1.930	2.080	2.170	2.210	2.270	2.310
3.0	1.300	1.520	1.890	2.290	2.490	2.620	2.680	2.760	2.810
3.5	1.520	1.750	2.160	2.640	2.900	3.060	3.150	3.250	3.320
4.0	1.770	2.020	2.450	2.990	3.310	3.510	3.620	3.740	3.830
4.5	2.050	2.310	2.770	3.360	3.720	3.960	4.090	4.240	4.340
5.0	2.370	2.630	3.100	3.730	4.140	4.410	4.570	4.740	4.860
5.5	2.710	2.980	3.460	4.120	4.570	4.870	5.050	5.250	5.380
6.0	3.090	3.360	3.840	4.520	5.010	5.340	5.530	5.770	5.910



PRESSURE TRAVERSE for 2-in. tubing (1.995-in. i.d.). **Fig. 1.**



PRESSURE TRAVERSE for 2.5-in. tubing (2.441-in. i.d.). Fig. 2.

In standard oil-field units:

$$\rho W_t = \Delta P_t = 13{,}800\ (Q^2 f h \rho / d^5) \quad (3)$$

where:

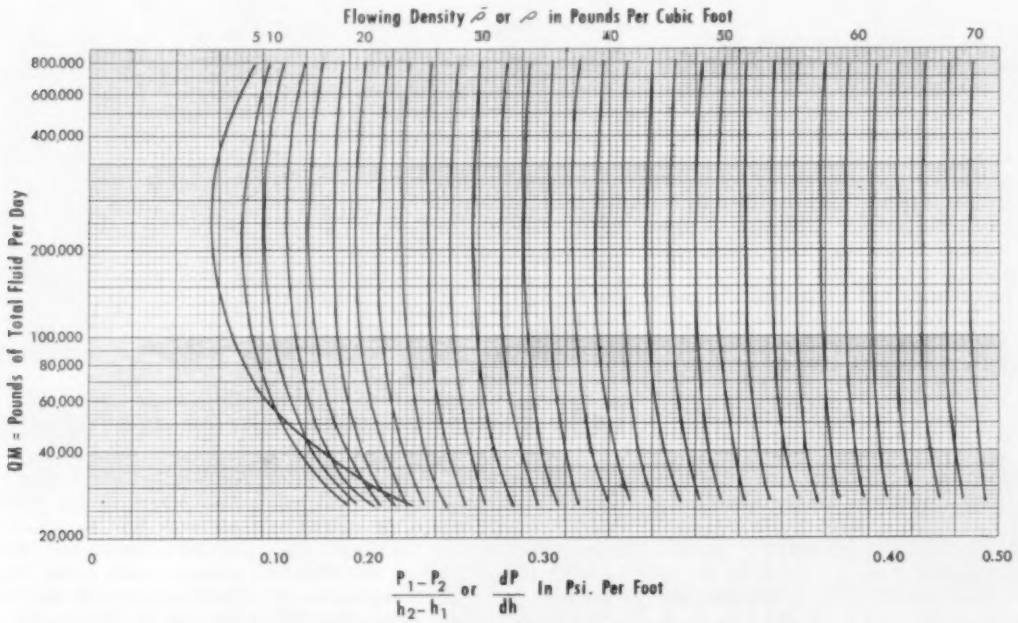
Q = production, bbl./day.
d = diameter of tubing, in.

Equation 2 may then be easily solved for P_f by substituting the value for ρW_t from Equation 3 back into this equation.

This approach may only be used as a rough approximation, or in those cases where the amount of gas or water produced is quite small. Where large amounts of gas are present, the assumption of an incompressible fluid is poor, for the gas produced has a profound effect on pressure drop.

Effect of gas and water . . . A better approach is offered by a method proposed by Poettman and Carpenter,[1] which takes into account the quantities of gas or water produced. They developed a correlation, including a friction-factor curve, for flowing wells and gas-lift wells where the gas-oil ratio varied from 342 to 41,800 s.c.f. per bbl., and the water-oil ratio varied from 5.90 to 56.4 bbl./bbl.

Figs. 1, 2, and 3 summarize the results and offer the simplest solution for the most common sizes of tubing. The following equations, 4-7, have been derived to enable use of these figures:



PRESSURE TRAVERSE for 3-in. tubing (3.068-in. i.d.). Fig. 3.

$$\bar{\rho} = \frac{M}{V_m} = \frac{M}{\int_{P_2}^{P_1} V_m\,dP \Big/ (P_1 - P_2)} \qquad (4)$$

$$\int_{P_2}^{P_1} V_m\,dP = 2.81\,n_f\,(P_1^2 - P_2^2) + (5.61\beta_1 + V_w)(P_1 - P_2) + \frac{P_s T_a}{T_s}\left[(R - r_1)\int_{P_2}^{P_1}\frac{Z}{P}\,dP - n_s\int_{P_2}^{P_1} Z\,dP\right] \qquad (5)$$

$$\int_{P_2}^{P_1}\frac{Z}{P}\,dP = \int_{0.2}^{P_{r1}}\frac{Z}{P_r}\,dP_r - \int_{0.2}^{P_{r2}}\frac{Z}{P_r}\,dP_r \qquad (6)$$

$$\int_{P_2}^{P_1} Z\,dP = P_c\int_{0.2}^{P_{r1}} Z\,dP_r - \int_{0.2}^{P_{r2}} Z\,dP_r \qquad (7)$$

where:

V_m = integrated avg. V_m between P_1 and P_2.
V_m = cu. ft. of gas, oil, and water per bbl. of stock-tank oil at pressure P.
M = lb. of gas, oil, and water produced per bbl. of stock-tank oil.
P_1 = pressure at depth Δh, psia.
P_2 = wellhead pressure, psia.
n_f = slope of formation - volume-factor curve.
β_1 = intercept on formation - volume-factor curve.
V_w = cu. ft. water produced per bbl. stock-tank oil.
R = gas-oil ratio, s.c.f./bbl. stock-tank oil.
r_1 = intercept of solubility curve.
P_s = base pressure, psia.
T_s = base temperature, °R.
T_a = average temperature in well, °R.
Q = lb. of stock-tank oil per day.
$\Delta h = h_1 - h_2$ = feet between P_1 and P_2.
h_2 = wellhead elevation above h_1.
h_1 = depth at pressure $P_1 = 0$ at formation.

The solution is not quite as formidable as it might appear from examination of the above equations. It does require, however, the laboratory differential liberation curve showing formation volume factor (β) and gas solubility (r) as a function of pressure, as well as the specific gravity or composition of the flare gas. The latter is used to determine P_c and T_c, which in turn yield P_r and T_r (see Part 34).

The slope of the formation-volume-factor and solubility curves is determined by drawing the best single straight line through the data. The intercept of this straight line at the ordinate yields the values β_1 and r_1.

The simplest procedure is to solve Equations 6 and 7, substitute the integrals into Equation 5, and then substitute the value $\int V_m dP$ into Equation 4. Solution of Equation 4 then yields the value of $\bar{\rho}$ between the limits of P_1 and P_2. Values of constant $\bar{\rho}$ are shown as curved lines in Figs. 1-3.

Equation 7 may be easily solved using Table 1. Pressures P_1 and P_2 are converted to P_{r1} and P_{r2}, and the corresponding values of the integral read interpolating if necessary.

Equation 6 is solved in similar manner by using Table 1 in Part 39.

The general solution for bottom-hole pressure may be summarized as follows:

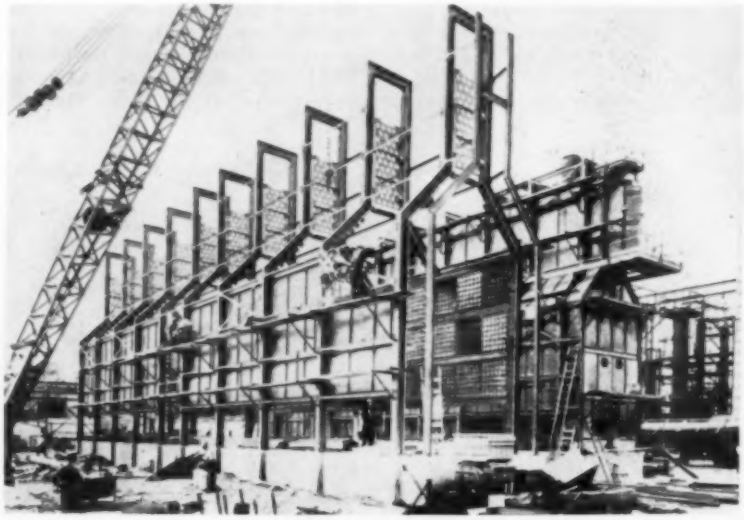
1. Assume a value of P_1.
2. Solve for $\bar{\rho}$, as shown above, between P_2 and assumed value P_1.
3. Calculate QM.
4. Determine the proper value of $(P_1 - P_2)/(h_2 - h_1)$ from the appropriate figure for the proper tubing size.
5. Dividing this value into P_1 and P_2, the limits used for calculating $\bar{\rho}$, yields $h_2 - h_1$.
6. Plot assumed pressure P_1 versus $(h_2 - h_1)$ on coordinate paper.
7. Assume several more values of P_1, and calculate the corresponding values of $(h_2 - h_1)$ using the above procedure.
8. Draw best curve through points on P_1 versus $(h_2 - h_1)$ plot. Where curve intersects proper formation depth, one may then read the proper bottom-hole pressure.

The curve thus obtained is fairly straight, and three pressure points usually suffice, as long as one of them is fairly close to the bottom-hole pressure so that no long extrapolation is necessary.

This procedure is recommended where the gas-oil ratio does not exceed 30,000:1. Above 30,000:1 the procedures outlined in Part 40 are recommended.

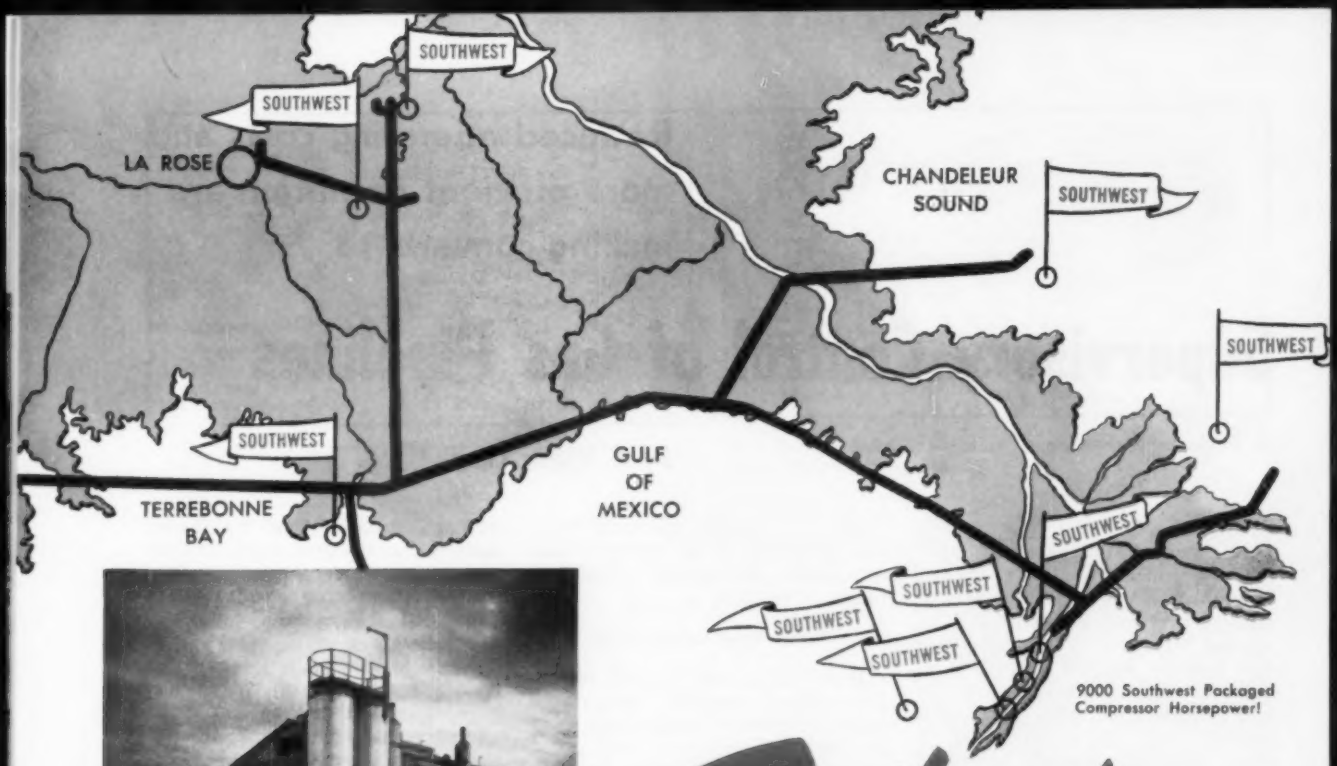
Bibliography

1. Poettman, F. H., and Carpenter, P. G., A.P.I. Drilling and Production Practice, 257 (1952).



Gulf Building Two Large Reformers

THIS heater is one of the largest heaters ever to be designed for a catalytic reforming unit. It is being erected by Procon, Inc., at Gulf Oil Corp.'s Philadelphia refinery, where two 26,000-bbl. per day Platforming units are under construction. More than 100 ft. long, the outsized-heater installations will each handle two intermediate stages. Single heaters are used for each unit to insure best use of available space and maximum construction and piping economy. The Platforming units are the second and third to be built at the refinery, and are expected to go on stream soon.



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Reduced operating costs and more efficient operation are making converts to

Supervisory Control of Gas Pipelines

By F. Vinton Long

ABOUT the first thing that pipeline management must decide about "push-button operated" pipelines is whether or not to try it at all. Advantages of reduced operating personnel and increased efficiency of the remaining men must be weighed against the installation cost of control equipment and the additional safety precautions required with the resulting risk of down time of remotely controlled compressor stations. This means that such installations must be examined on a case-by-case basis.

Push-button operation will be indicated for a majority of systems, at least to some extent, and assuming that management desires to go that route, the next step is to decide whether to control the entire line and all the compressor stations from a central point or divide the system into two or more control sections.

There are advantages to either choice. But in either case it is desirable to transmit or telemeter certain vital dispatching information such as pressures and flow to one central office. This permits the entire pipeline operation to be observed and appropriate dispatching instructions issued as required.

Author is chief of communications section, engineering department, Texas Eastern Transmission Corp., Shreveport, La. Paper presented at A.S.M.E. Petroleum Conference, Tulsa, September 22-25.

What Type of Control?

If the line is sectionalized for remote-control purposes, the control centers will receive instructions from the central dispatch office, and through their push-button facilities control the stations within their jurisdiction. Each section is complete within itself, and as far as physical control is concerned might be considered an independent pipeline.

Advantages of this type of operation are that long communication circuits for control use are not required and the control personnel of each section are nearer to and in closer contact with the stations under their control. The personnel stationed at these control centers can also act as backup for emergencies that might occur within their area.

Proceeding further, it may be inadvisable, for economic or operational reasons, to remove all personnel from certain compressor stations. And these points might well be chosen to act as control centers for one or more stations adjacent to them. This is particularly true if you concentrate your personnel at the larger reciprocating-powered stations, and have them control electric or turbine-powered stations adjacent to them.

Adequate communication channels are required between the central dispatch office and each of the section control points and may consist of voice or teletype circuits. The advantage of controlling the entire system from a central point at the present time is largely confined to reduction of control personnel.

This condition will hold true until the advent of the "automatic pipeline."

Automatic Pipeline Doesn't Exist

Although we hear a lot of discussion about automation of pipelines, there are no automatic pipelines in operation today. An automatic pipeline is one which operates without human supervision, from a previously programed set of instructions. Automation of pipelines requires the use of feedback in the control system and we just do not have the facilities at this time.

Automation of a pipeline requires a knowledge and use of art of cybernetics, and its reduction to control simple things such as valve control and compressor speed. Equipment for automation is rapidly becoming available and it is only a matter of time before some company places on stream the first fully automatic pipeline. All of the equipment and control facilities are now available for efficient supervisory control of a manual or nonautomatic control system and the two choices of operation have been outlined.

New Surge Control Device

With either choice, certain safeguards for compressor station operation are required and just this year one of the larger gas pipelines developed a device which will reduce the compressor-surge hazard which

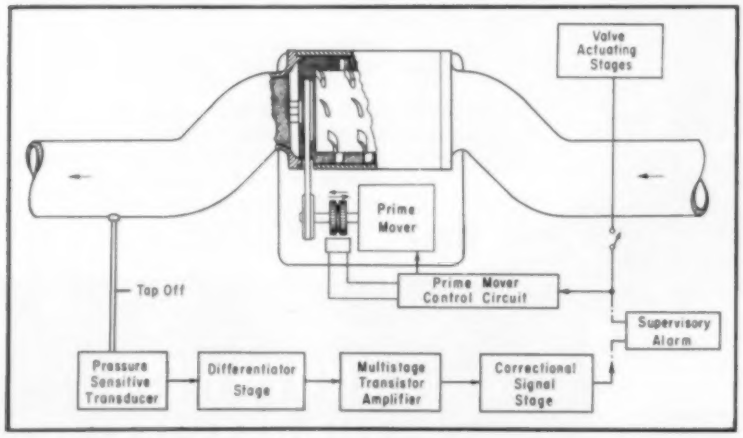
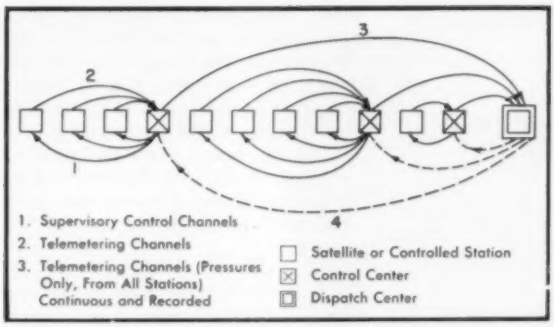
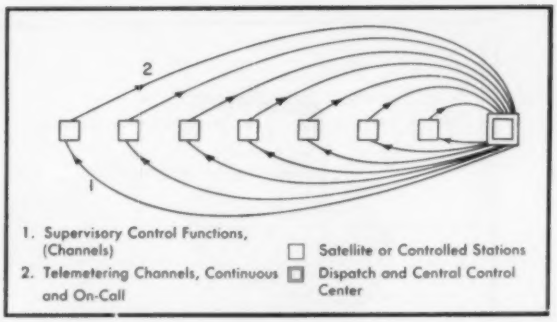


DIAGRAM of control system for reducing compressor surge hazard. Fig. 1.


1. Supervisory Control Channels
2. Telemetering Channels
3. Telemetering Channels (Pressures Only, From All Stations) Continuous and Recorded
Satellite or Controlled Station
Control Center
Dispatch Center

LOCALIZED control system within a section. Fig. 2.


1. Supervisory Control Functions, (Channels)
2. Telemetering Channels, Continuous and On-Call
Satellite or Controlled Stations
Dispatch and Central Control Center

CONTROL installation where all information is transmitted to master control center. Fig. 3.

can develop at centrifugal blower-type stations. Such protection is an absolute necessity at unattended stations. Pipelines can be designed so that the centrifugal compressors operate at the noncritical portion of their efficiency curve. But no amount of designing can eliminate abnormal pipeline pack and flow conditions which will inadvertently change these optimum operating conditions.

You can probably design centrifugal compressors so it would be almost impossible for them to surge, but by so doing you would sacrifice efficiency, and sacrificed efficiency means increased dollars for power bills to run them. So it's economical to try for highest efficiency and provide surge protection for the few times that abnormal conditions occur.

This surge-control device uses the feedback principle of control. A transducer watches the pressure variations at the discharge side of the station and transmits this to a device which goes into operation if this pressure starts to oscillate or "surge" and takes steps to control or eliminate the surge condition. This is done by gradually opening a recirculating or bypass valve to give the compressor more load, in the case of an electrical constant-speed unit, or in some cases reducing the speed of a turbine or other variable-speed drive if such is used.

Ordered changes in pressure or transient blips will be observed but will not trigger the device. It is designed to keep the station on the line if at all possible while corrective action is taken. It will also permit the station to remain safely on the line even in the critical range of compressor operation. Without such a protective device it would be necessary to play safe and take it off the line.

In some cases this device may be used to detect a presurge or critical operating condition and transmit this warning to the control center so that remedial action can be taken before an actual surge occurs. Installation of a typical surge-control device is shown in Fig. 1.

Control Systems

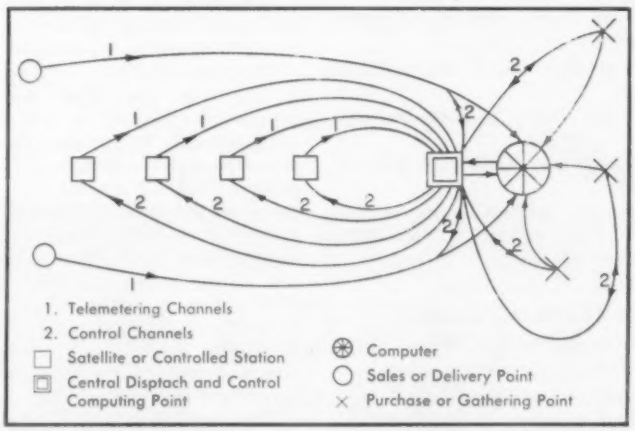
A typical sectionalized control system is shown in Fig. 2. Note that no actual operating information is transmitted beyond the section control center except pressures and possibly blower speed.

If all control is centered in one point, a typical installation is shown in Fig. 3. Note that all of the information which might be transmitted to the section control points must now be sent to the master control center. This may require several communication channels, particularly if continuous telemetering is required, but the cost of these channels is balanced by the reduction of control personnel.

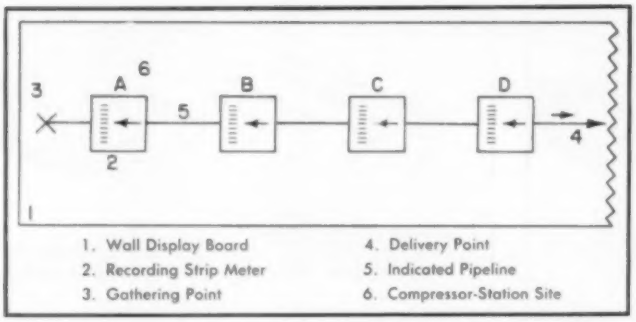
Although its operation is not a part of this paper, a typical future "automatic" pipeline layout is shown in Fig. 4. Note the "closed circuit" operation, with feedback loops from gathering and sales points, through a computer into the control device.

The number of alarm and control functions transmitted between the control center and the controlled station will vary considerably, both as to type of compressor-station involved and the desires of the company that operates them. In general, the stations should have automatic operation within themselves as much as possible, with sequencing controls so that they may be started or shut down by means of one supervisory function. This automatic sequencing is quite simple on electric-motor-drive stations, more involved with turbine drive, and quite complicated with reciprocating-engine drive. Fortunately, the turbine-powered stations are pretty well equipped for remote-control use, and some of the latest reciprocating-engine-driven stations are being installed with remote operation in mind.

Conversion to remote control of the older reciprocating-engine-driven stations is quite expensive. This is due to the problem of adding various controls and valves to an existing station; the actual supervisory-control equipment cost is not excessive. For this reason, it is sometimes better to keep personnel at the reciprocating stations, and have these men control any turbine or electric stations which are adjacent to them.



FUTURE "automatic" pipeline control layout with feed back loops through computer. Fig. 4.



CONTINUOUS recorders of strip type mounted horizontally to facilitate observing at a glance the pressure status of the entire line. Fig. 5.

Control and Telemetering Functions

Examples of control and telemetering functions are listed below which would be typical of the requirements for remote operation of a compressor station. This list does not include control of gathering-line or delivery-point valves.

Here are the functions for all types of stations:

1. Suction and discharge pressures are transmitted to each section control center, and in addition, to the central dispatch office on a continuous and recorded basis.
2. High gas-pressure alarm.
3. Gas-leak alarm.
4. Gas temperature. On call basis.
5. Surge detector or near-surge condition alarm (centrifugal compressors only).
6. Unit shutdown alarm.
7. Emergency station shutdown alarm.
8. Compressor speed (if indicated).
9. Abnormal condition alarm.
10. Compressor start and stop.
11. Open and close station bypass valve (optional).

Here are added functions required for motor-driven centrifugal-compressor stations:

1. Individual motor kilowatt load. On call.
2. Total station kilowatt load. On call.
3. Compressor guide-vane position. On call.
4. Station demand alarm, to indicate when demand is approaching the maximum set point.
5. Unit shutdown alarm.
6. Station shutdown alarm.
7. Main power-loss alarm.
8. Abnormal condition alarm.
9. Guide-vane adjust control.

Added functions for reciprocating units are:

1. Speed controller.
2. Shut down plus lockout alarm.

Added functions for gas-turbine units:

1. Load turbine-speed controller.
2. Telemeter load-shaft speed for each unit. On call.
3. Telemeter axial compressor shaft speed each unit. On call.

Dispatching, Data Display

The dispatch center, whether or not the control system is sectionalized, should receive complete information as to the pack and flow of the gas. This should include not only all compressor-station points but information as to volume of received gas from gathering points and volume delivered to various sales points along the line. Only then can an accurate picture be observed of true line condition. This information should be continuously recorded, and some day it will also be used for accounting purposes.

Gas lines might take a look at the methods of some products lines, and employ a visual indication of the state of the line. This could be done with a wall-mounted display board, which would show the pipeline plus compressors, gathering, and delivery points. Lights would show the stations in operation and in some cases meters would indicate the engine speed or other pertinent information.

The continuous recorders would be of the strip type. They would be mounted horizontally so that the recording needle, at optimum operating pressures, would normally fall in a position identical to the line designated as the pipeline on the operating board. If the pressure rose above this optimum point, or dropped below it, the indicating needle would vary above or below the indicated pipeline and the pressure status of the entire line would be observed at a glance. A form of this visual presentation board is shown in Fig. 5.

This method of presentation could be amplified so that the visual display board would be of a translucent material. The pipeline position and other data could be inked or etched in, and the pressure indications indicated on, above, or below this line by means of a spot of light from the recording meter which would shine through the translucent board. This information at a later date could be absorbed by computers which in turn would issue optimum operating instructions for the pipeline.

All of this would release personnel from locally tending compressors and changing valve settings and meter charts and figuring optimum rates of flow. It would give them more time to think, and to operate the line at utmost efficiency.

Communications, Telemetering

There are several suppliers of supervisory-control equipment for pipeline use and all of them are good. In general, if long communication circuits are required, it is well to investigate the several types of complex coding techniques available which tend to eliminate malfunctions due to noise or "static" on the channel.

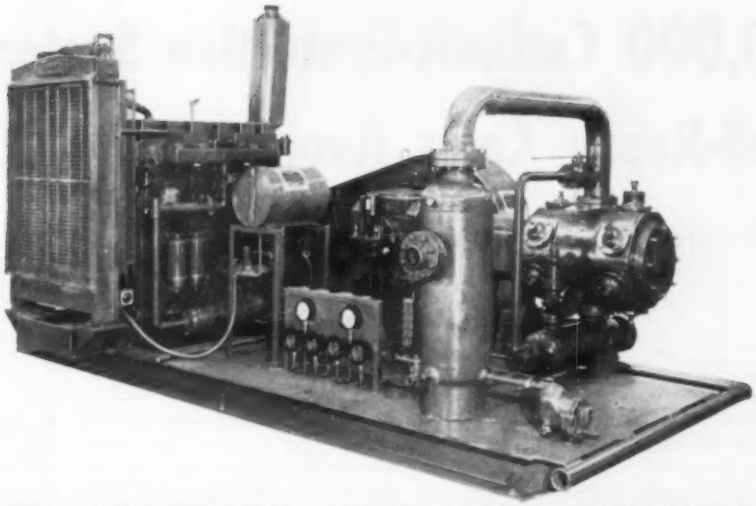
These systems are divided into two groups. One uses a narrow band or telegraph-type communication channel, and the other a wider band voice-type channel. Continuous telemetering requires a tone for each function, and usually is obtained by using a voice-type channel which can be divided into several control and telemetering functions.

The "automatic pipeline" will require some form of continuous telemetering to provide continuous feedback information to the master control center.

Whether this will be in the form of analog "slide rule" information or digital "typewritten" data is largely conjecture at this time. The writer can visualize a computer arrangement with smoothly variable values of flow and demand acting as forces on the mechanical brain which interprets them and issues instructions to the pipeline-control mechanism.

The digital technique of information transmission just now hitting the pipelines is the result of military requirements brought on by missile control. The target-seeking or self-guided missile, uses, I believe, analog techniques of control and is truly an automatic-pipeline type of operation.

For a variety of reasons the gas pipelines have as a group been somewhat hesitant to go into the supervisory-controlled pipeline business. However, reduced operating costs and more efficient line operation will surely convince more and more managements that supervisory control of gas pipelines is here to stay. **End.**



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$10,000 Cathodic-Protection System Combats Well-Repair Costs Averaging $4,000

A current of 1.5 to 2.0 amp. is protecting casing of 6,000-ft. wells at Waskom field

By G. L. Doremus and J. J. Lawnick

TO CONTROL external casing corrosion in the shallow formations, a cathodic protection system has been installed on 48 wells in Waskom field in East Texas. Six selenium rectifiers in conjunction with graphite anode beds, supplemented by 206 high-potential magnesium anodes, are used to supply 1.5 to 2.0-amp. current drain per well. This requirement is based on casing potential-profile measurements.

Before cathodic protection, repairs of casing leaks had cost an average of $4,000 per well. Although the wells are about 6,000 ft. deep, corrosion was most concentrated between 1,000 and 1,600 ft. and was evident to 2,500 ft.

Application of 1.5 to 2.0 amp. to a well showed protection to 2,500 to 3,000 ft. However, the current-potential break method for two wells in this field indicated necessary protective current to be more than double this amount.

Estimated installation cost of the cathodic protection system is slightly more than $10,000. Power cost is about $85 per month. On the basis of corrosion losses for the first 5 years of well life, the cathodic-protection system for the well casing has a potential return of many times its installation and operation cost, provided it approaches 100 per cent effectiveness.

Waskom Field

Waskom field lies principally in southeastern Harrison County, Texas, and extends into Caddo Parish, Louisiana. The field is formed by an anticlinal feature, one of several, superimposed on the Sabine uplift. Apex of the local structure is about 1 mile southwest of Waskom, Tex. Principal production today is from the Hill, upper Pettet, and Travis Peak zones. At present there are approximately 170 gas wells and 100 oil wells producing in the field.

A typical casing program involves approximately 1,000 ft. of 9⅝ or 10¾-in. surface casing with cement returned to the surface. Less than this amount of surface casing was set in some cases after permission had been obtained from the Texas Railroad Commission. The production casing is usually 5½-in. cemented at approximately 6,000 ft. with 200 to 400 sacks of cement. Tubing is 2⅜-in., ordinarily hung on a packer set just above the producing horizon. In the case of dual completion, tubing usually is set between the producing sands.

La Gloria Oil & Gas Co. owns and operates a group of 48 wells in the central portion of Waskom field (28 oil, 7 gas, 8 dual-completion, 1 salt-water supply, and 3 injection wells, with 1 well temporarily abandoned).

Corrosion History

As a result of corrosion failure occurring in April 1954, the production casing of one well was pulled and repaired to a depth of 2,536 ft. The section of casing from 1,013 to 1,561 ft., most of which was opposite the Nacatoch sand (Fig. 1), was severely pitted as a result of external corrosion. Penetration had occurred at 1,414 ft. and a trace of corrosion was found to a depth of 2,506 ft. Cost of this casing repair job was estimated to be $22,000, exclusive of lost production. Age of the well at time of failure was less than 5 years.

A study of the problem throughout the field was immediately initiated. Two additional casing leaks were found, one at a depth of 2,130 ft. and the second at 1,500 ft. in wells less than 5 years old. Cost of subsequent repairs averaged $4,000 per well, and in addition, oil production from one well, a dual completion, was lost.

Cathodic Protection Survey

With the prospect of ever-increasing casing-repair costs, cathodic protection was sought as a possible solution to the severe casing corrosion problem. Accordingly, in July 1954 an engineering survey was made to determine the current requirements and the economics of cathodic protection.

During this survey, two wells were disconnected from flow lines and normal casing potential profiles were run. The internal tool used had spring-loaded contactors on 25-ft. spacing. On one well, 2 Downer, these runs were repeated with 1-amp. and 2-amp. current drains at the wellhead. The disconnected gas flow lines served as a temporary ground bed.

Change in profile . . . Results of these tests are shown graphically in Fig. 1. Effect of current drain was noticeable to 2,500 to 3,000 ft. Good shifts were produced through the troublesome Nacatoch and Blossom formations, where the casing failures had occurred.

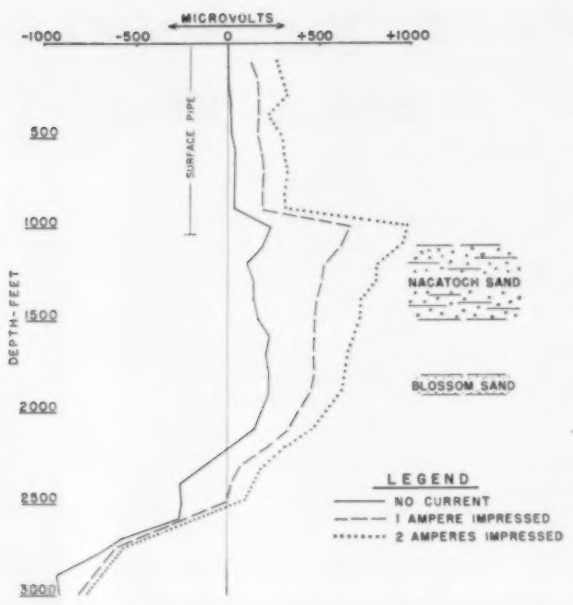
Although not depicted in Fig. 1, a general anodic area was shown by the casing profile starting at 2,900 ft. and extending downward for almost 3,000 ft. Neither of the test current drains had much effect on the casing profile at these greater depths.

All casing failures to date have occurred in the shallower zones where substantial shifts were produced in the casing profile by the test currents. Therefore a 1.5 to 2.0-amp. drain was selected as optimum for protection of well casings in Waskom field.

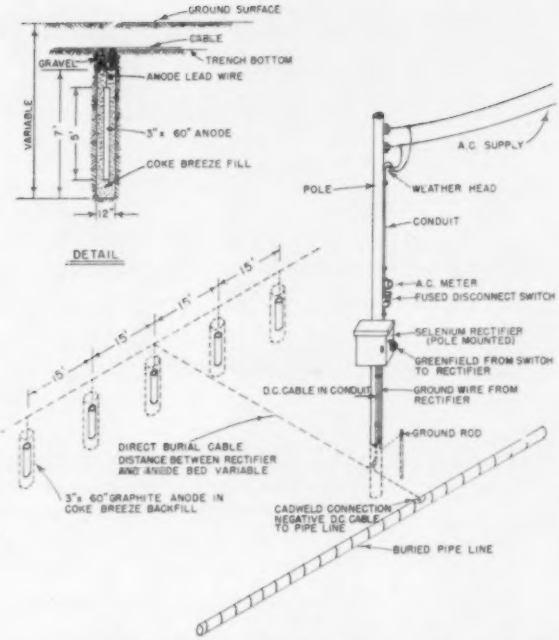
Rectifier Ground-Bed Design

A multiple rectifier-ground bed installation was selected as the most economical source of protective current based on the use of gas and oil lines from the wells for current distribution.

Wells were not insulated during this preliminary stage. The more economical course appeared to be to determine the exact degree of protective current spread which could be realized from the ultimate rectifier installations. Then control of current drain at each well would be possible. Data were gathered, from which esti-



CASING POTENTIAL showed this profile in tests of cathodic protection. Current drain is noticeable to 2,500 to 3,000 ft. Fig. 1.



RECTIFIER INSTALLATION includes air-cooled selenium rectifier and graphite anodes. Fig. 3.

mates of ultimate current drain could be made, by conducting welding-generator tests at several locations in the field.

After these tests, a preliminary cathodic-protection design was made. The basis was a total current drain of 170 amp. Current was to be supplied by four air-cooled selenium rectifiers as shown by Fig. 2. (Note: No. 5 indicates rectifier used for internal cathodic protection of vessels used in a water-flood project and has no connection with casing protection.) Rectifier locations were more or less dictated by power availability and were not considered ideal from a current-distribution standpoint.

Fortunately, very few foreign pipe lines were found in the field and it was possible to select ground-bed locations which were considered unlikely to lead to serious interference problems.

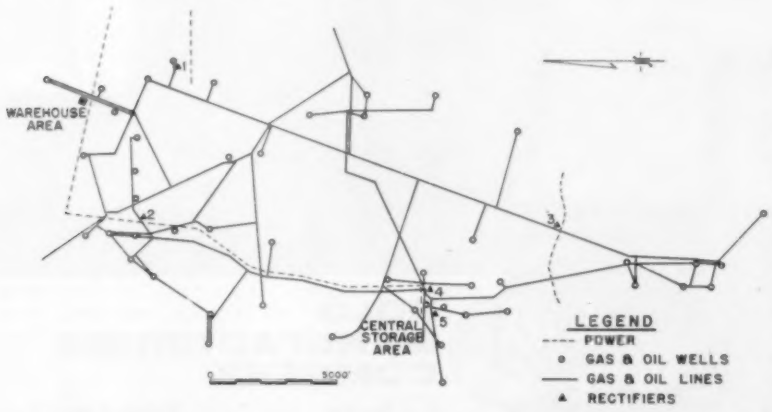
Cathodic Protection—Phase 1

In March 1955, rectifiers 1 through 4 were installed with their associated ground beds as planned. Concurrently, all wellheads were isolated with high-pressure insulation unions or flanges. Where dual completions were encountered, dual insulation was necessary.

The rectifier-ground bed installations were constructed in accordance with customary cathodic-protection practices. A typical pole-mounted air-cooled rectifier is shown in Fig. 3.

At each wellhead bond wires were "cadwelded" to the well and to the adjacent flow line below grade. These wires were then brought up inside a 2-in. pipe marker into a 6 by 6 by 4-in. galvanized junction box. This box housed an 0.01-ohm shunt and resistance wire as necessary for ultimate control of current drain from the wellhead.

Fig. 4 shows a typical dual-completion well hookup, with pipe marker and junction box located next to the oil flow line for protection. Fig. 5 shows a closeup of the junction box at this location. This method of handling the bonding wires and circuit elements was considered essential to avoid possible damage in the course of disconnecting, testing, and reworking the wells from time to time.



LAYOUT of wells, lines and power in La Gloria's portion of Waskom field. Five rectifiers were used initially to supply d.c. current. Fig. 2.

Current conductors . . . In addition to wellhead bonding, a number of crossbonds between oil and gas lines were made after energization of the rectifiers. This was to achieve the best possible current distribution from the four rectifier drain points. The screw-coupled, small-diameter oil lines (2 in. and 2½ in.) proved both troublesome and disappointing in that many high-resistance joints had to be traced down and bonded, and IR drops in the lines rapidly reduced their effectiveness as drainage leads to remote wells. As a result, the coated gas lines were utilized for conductors wherever possible. In several cases, long sections of the bare oil

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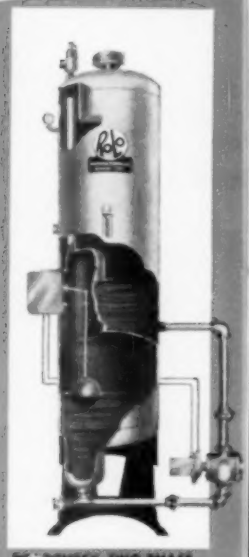

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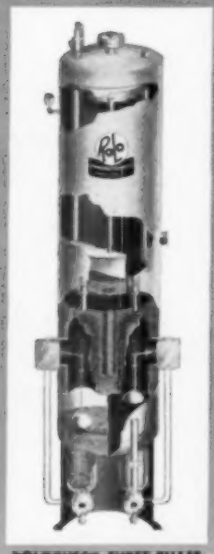

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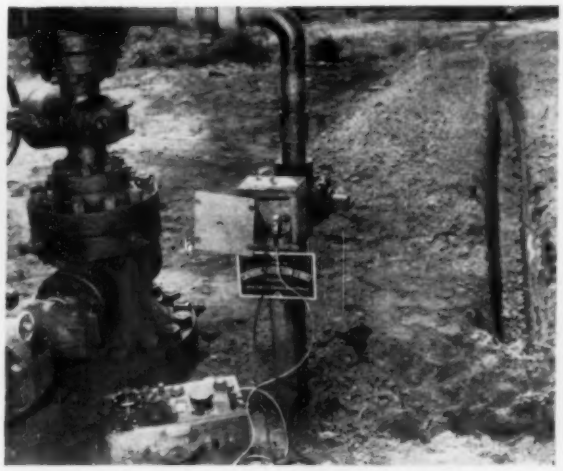
DUAL-COMPLETION well has current wires connected to casing and flow line. Fig. 4.



JUNCTION BOX contains drainage leads, shunt and resistance wire for control of current. Fig. 5.

lines were actually insulated off to conserve current for the wells.

After much testing, adjusting, bonding, and isolating it became apparent that the existing flow lines provided inadequate electrical connections to attain the desired 1.5 amp. drain per well for all 48 wells. At this point, with a total rectifier drain of 170 amp., 27 wells were receiving the desired minimum drain of 1.5 amp., while the remaining 21 were only partially protected.

Further tests showed that two small 35-v., 9-amp. rectifiers at locations 6 and 7 (Fig. 6) would take care of an additional seven wells and that the remainder of 14 wells could best be handled, either fully or in supplement to rectifier drainage, by use of the new high-potential magnesium anodes. A number of old mud pits provided beds for the anodes.

Cathodic Protection—Phase 2

In July 1955 the two small 9-amp. rectifiers were added as planned. One rectifier (No. 6) was connected to an existing meter serving unit No. 2 via a 1,700-ft. a.c. line extension. The other (No. 7) was connected to an existing meter at the warehouse. This was done to minimize power costs and thus keep total operating costs within reason.

Ground beds for these units consisted of 12 and 8 3 by 60-in. graphite anodes, respectively. These units performed as anticipated. Another seven wells were added to the list of those receiving the desired minimum current drain, and at this point the final group of installations involving magnesium anodes was started.

Magnesium-anode installations were designed for a 10-year life. A rating of 80 ma. per 17-lb., high-potential anode was selected for installation without prepared backfill. It appeared that best performance at minimum cost could be obtained by ditching 4 ft. deep through old mud pits or waste-disposal areas and installing the anodes horizontally in the bottom of this ditch. A minimum distance from the wellhead of 85 ft. was maintained to give satisfactory vertical current distribution. The anode connecting cable (usually No. 4 copper, to minimize IR drop) was run over to the wellhead in a shallow ditch and brought up into the junction box at that point.

Current obtained . . . An experimental, 20-anode installation of this type had been made at one well during the latter stages of Phase 1. In order to get full 1.5-amp. output, the soil was given a limited brine treatment in the anode area. Some 4 months later, after many substantial rains, the output of this group had increased slightly rather than decreased. This indicated that such treatment was justifiable where necessary. Preliminary work by others[1] had indicated that the high-potential magnesium anode maintains good current efficiency at moderate current outputs in saline environment.

Accordingly, a total of nine wells were so protected with groups of 20 17-lb. anodes, using brine treatment as necessary to produce somewhat more than 1.5 amp. total output. After this, current was restricted to 1.5 to 1.6 amp. with resistance wire. This procedure provided a small reserve in output which may be called upon at some later date should the resistance of the anode bed increase appreciably as a result of leaching. In each case the flow line was left fully insulated, and in fact many were "dead," having been purposely isolated to conserve rectifier current.

At the remaining five wells, where substantial but inadequate current was available from the rectifier system, magnesium anodes were added to supplement existing current and provide the needed 1.5-amp. drain per well.

Altogether, 206 magnesium anodes

THE AUTHORS

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J. L. LAWNICK

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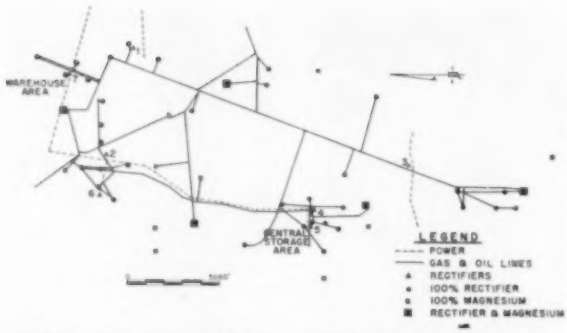
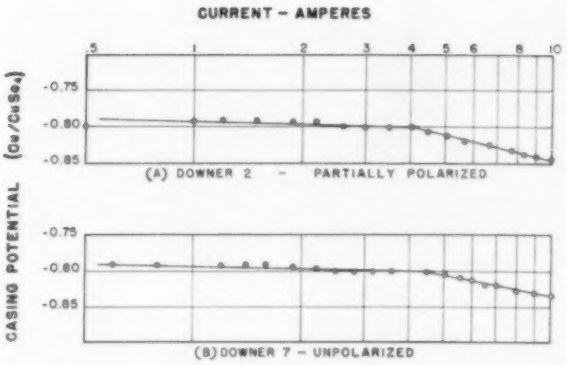
J. J. Lawnick is assistant chief petroleum engineer for La Gloria Oil & Gas Co., Corpus Christi, Tex. He served in the Marines during World War II and returned to University of Oklahoma to receive a B.S. in petroleum engineering. Before joining La Gloria in 1953, he was with Shell Oil Co. Lawnick also holds a professional degree in petroleum engineering from the University of Oklahoma and is a registered professional engineer in the State of Texas.

This article contains information which was originally presented in Corrosion magazine, August 1956.



SUPPLEMENTAL CURRENT was added by rectifiers 6 and 7 and magnesium-anode installation to give protection shown in Table 1. Fig. 6.



CURRENT-POTENTIAL measurements were made on Well A, after it had received a 2 amp. drain and on Well B which received no current. Fig. 7.

TABLE 1
Survey of Wells After Application of Cathodic Protection

Well No.	Type of production	Well-to-soil potentials* (volt)	Current drain (amp.) 8-14-55	4-26-56	Source of current†
1	Temp. Abandoned		1.60	1.50	R
2	Gas		1.55	1.70	RM
3	Oil-Gas	—0.83	1.80	2.00	R
4	Oil	—0.87	1.55	2.10	R
5	Oil		1.60	2.10	R
6	Oil		1.95	1.80	R
7	Oil-Gas	—0.84	1.50	‡	R
8	Oil-Gas		1.50	1.80	R
9	Oil		1.65	1.80	R
10	Oil		1.70	1.85	R
11	Oil		1.55	1.50	M
12	Gas		1.60	1.50	M
13	Oil	—0.75	1.65	2.00	R
14	Oil-Gas		1.50	1.70	RM
15	Oil		1.55	1.55	M
16	Oil		1.75	1.45	R
17	Oil		1.75	1.80	R
18	Oil		1.70	1.50	R
19	Oil		1.65	1.50	M
20	Oil		1.85	1.60	M
21	Gas		1.80	1.50	RM
22	Oil		1.35	2.30	R
23	Oil		1.50	1.55	M
24	Gas	—0.99	1.60	1.40	R
25	Oil		1.55	1.70	R
26	Gas-Gas		1.65	1.50	R
27	Gas-Gas		1.55	2.00	R
28	Oil		1.55	1.35	R
29	Gas	—0.89	1.50	1.45	R
30	S. W. Injection		1.55	1.50	M
31	Oil		1.50	2.10	R
32	Oil		1.55	1.60	R
33	S. W. Injection		1.50	0.90	R
34	Gas	—0.90	1.55	1.45	R
35	Oil		1.60	2.30	R
36	Oil		1.55	1.50	R
37	Oil	—0.84	1.70	0.50	R
38	Gas		1.80	1.50	R
39	S. W. Supply		1.90	1.70	R
40	Oil		1.50	1.45	RM
41	Oil-Gas		1.55	1.40	R
42	Oil		2.00	2.50	R
43	S. W. Injection		1.50	1.50	M
44	Oil-Gas	—0.81	1.50	1.50	R
45	Oil	—0.74	1.80	1.50	R
46	Oil	—0.97	1.50	1.45	M
47	Oil		1.80	2.50	RM
48	Oil	—0.88	1.90	3.00	R

*Referred to $Cu/CuSO_4$ electrode 75 ft. from wellhead. †M—magnesium, R—rectifier, RM—rectifier and magnesium. ‡Well being reworked.

were installed. They provided a total drain of 16.5 amp. in addition to the 188 amp. being drained at the six rectifiers.

Fig. 6 shows conditions at the field as they existed on August 14, 1955, at time of final survey. The final survey data are summarized in Table 1.

After completion of the cathodic protection system the expense of repeating a well casing potential log did not seem necessary to reaffirm performance of 1.5 amp. drain for a selected well. However, the opportunity to test two wells by the simple, inexpensive current-potential break method[2] was not overlooked.

Plans for the tests were made well in advance of completion of the installation. This made it possible to set up the following conditions: (1) The 2 Downer well, which was originally surveyed by the potential-profile method, was provided with a full 2.0 amp. drain in early stages of installation, so that it would have maximum possible time for polarization prior to final testing. (2) The 7 Downer well, an offset to 2 Downer, was left disconnected (although provided with an available 1.5 amp. on demand) so that a curve could be obtained for an unpolarized well for purposes of comparison. It was later discovered that only 314 ft. of surface pipe had been set for 7 Downer, while 2 Downer had a full 1,021 ft.

Test hookup . . . Conventional circuitry for open-circuit potential readings was used in these tests.[3] The temporary ground bed for the 2 Downer well consisted of the disconnected gas-flow line as in the case of the earlier casing log tests on this well; for the 7 Downer well its magnesium-anode group was used. The copper sulfate reference electrode was located 100 ft. from the wellhead in each case. A vacuum-tube voltmeter with 1.6-v. range and a very low-resistance contact switch was found most desirable for accurate, duplicable readings.

Results . . . The curves obtained in these tests are shown in Fig. 7. A break is indicated at 4.1 amp. for 2 Downer, which had been receiving 2.0 amp. for almost 6 months, while 7 Downer, which had been left without current until tested, shows a break at 4.6 amp. The difference is in the direction which might have been anticipated (i.e., a lower current requirement indicated for the partially polarized well in spite of its longer surface string).

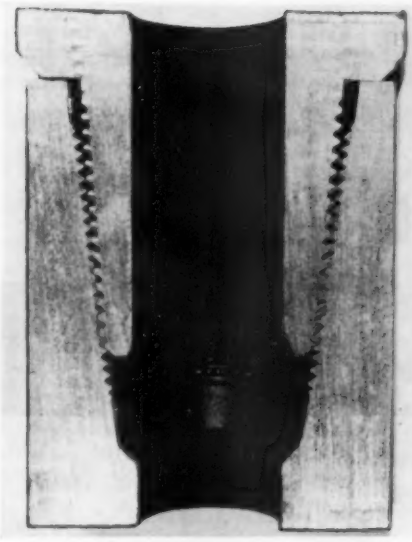
What is considered most significant is that this method of testing gives an indicated c u r r e n t requirement more than double that selected from that casing potential logs made during the preliminary survey. Remember that the value of 1.5 to 2.0 amp. was selected with view to specific performance in the upper casing levels, where corrosion experience had been worst. The current-potential break method presumably looks at more of the casing, if not all 6,000 ft. of it in the present case.

Acknowledgment

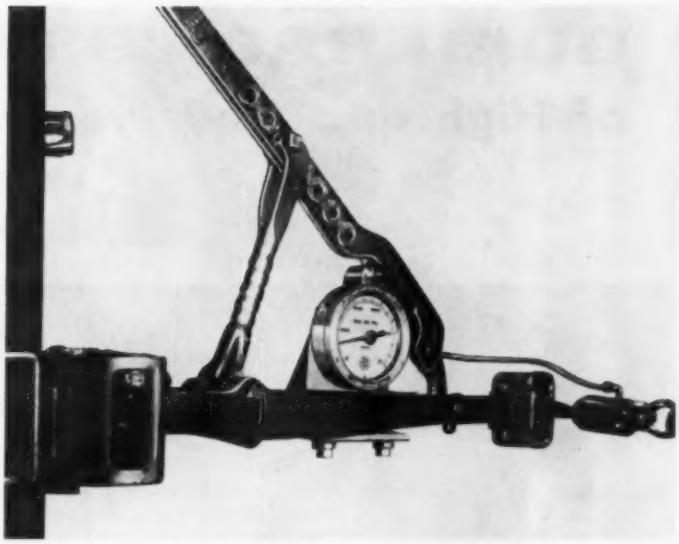
The assistance of Hugh W. Wilbanks, Jr., W. W. Mach, and Floyd B. Thorn, Jr., of Cathodic Protection Service, in field testing, installation, and interpretation and preparation of data, is gratefully acknowledged. The authors also acknowledge indebtedness to William H. Justice, of La Gloria Oil & Gas Co., for his interest and encouragement.

References

1. Osborn, Oliver, Dow Chemical Co. (private communication).
2. Ewing, S. P., and Bayhi, J. F., "Cathodic Protection of Casings in London Pool." Corrosion 4, No. 6 (1948), June, 264.
3. Barrett, J. P., and Gould, E. D., "Cathodic Protection in Action," World Oil, 142, 150, No. 4 (1956), March.



MISMATED CONNECTION — Cross-section of 4-in. full-hole pin made up in 4½-in. A.P.I. regular box. Such a connection between drill collars stayed together for entire 7,200-ft. hole. Fig. 1.



HYDRAULIC TONG TORQUE GAGE—A hydraulic cylinder is fastened in the tong line and loaded by tong-line tension. A pressure gage is calibrated to read line pulls in pounds. Fig. 2.

Report: Results obtained by use of

Controlled Drill-Stem Torque

in field operations

By Stanley C. Moore

MAKEUP TORQUE is by far the most important single factor in the performance of rotary shouldered connections.[1 2 3 4] And great care should be taken to assure proper field makeup. Actually, the torque used is only guessed at in almost all instances. The value attained may vary from 25 to 200 per cent of the recommended torque.

For this reason, a number of studies have been made of field makeup practices. These studies have led to these conclusions:

- For every rotary shouldered connection, whether it be on tool joints or drill collars, some degree of makeup torque control is essential, because there is a value so low that failure will occur and there is also a value so high that failure will occur.
- Every situation where rotary shouldered connections are used merits a critical economic analysis to determine if present procedures are adequate. If any money at all is spent for repairs to the connections or due to failures, there is a possibility of savings.
- Some conditions impose very high stresses on shouldered connections, and expensive and elaborate steps to attain the correct torque may be justified.
- Correct makeup torque may be all that is required to compensate for other contributing factors which are not up to standard.

Author is president, Drilco Oil Tools, Inc., Midland, Tex. Paper presented at the A.S.M.E. Petroleum Mechanical Conference, September 23-25, Tulsa.

Manufacturers' Recommendations

In its bearing on performance, the manufacturers' torque recommendations for rotary shouldered connections may be compared to tire manufacturers' air-pressure recommendations. Everyone understands the detrimental affects of overinflation or underinflation on tire life, and that even short periods of operation at too low pressure means a failure.

Not long ago an operator was having excessive trouble with his drill collars and defended his practice as to torque control. Measurements showed he was actually using values which varied from 4,300 to 23,000 lb.-ft. torque. The recommended value was 28,000. How would you get along with your tires if the recommended pressure was 28 psi. and you were using values all the way from 4 to 23 psi.?

Tires operated at too low pressure for even a short while may be permanently damaged, and the blowout which occurs months later correctly attributed to the abuse. Similarly, drill-stem connections overstressed temporarily by operation at too low torque may be permanently damaged, and the failure which occurs months later correctly attributed to the abuse.

Proper makeup torque may compensate for other factors not up to standard.

Mismated string . . . Recently a West Texas operator mated a 4-in. full-hole pin with a 4½-in. A.P.I. regular box in a drill-collar string and drilled a

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7,200-ft. hole with this strange combination. In this instance, thread taper, which is ordinarily controlled to 1½ per cent, varied 50 per cent between the two mating members. Thread lead, ordinarily controlled to one-fifth of 1 per cent, varied 25 per cent between the two members.

Apparently this odd connection performed satisfactorily because adequate torque was applied to achieve sufficient compressive loading between the shoulders. The unusual feat was repeated under laboratory conditions and 32,000 lb.-ft. torque was required to bring the shoulders together. It was not determined if adequate shoulder loads were attained. A cross-section of the mismated connections is illustrated in Fig. 1. Note how threads were forcibly deformed till they matched.

Collars vary . . . In another case a full string of drill collars was manufactured using carbon steel with a hardness of approximately 200 Brinell hardness and a yield strength of 55,000 psi. Ordinarily, material of 300 Brinell hardness and 125,000 psi. yield strength is used. Yet this drill-collar string operated satisfactorily so long as proper torque was used. The only difficulty with the string occurred when excessive torque deformed the low-yield material. With proper torque control the string apparently would have given normal service.

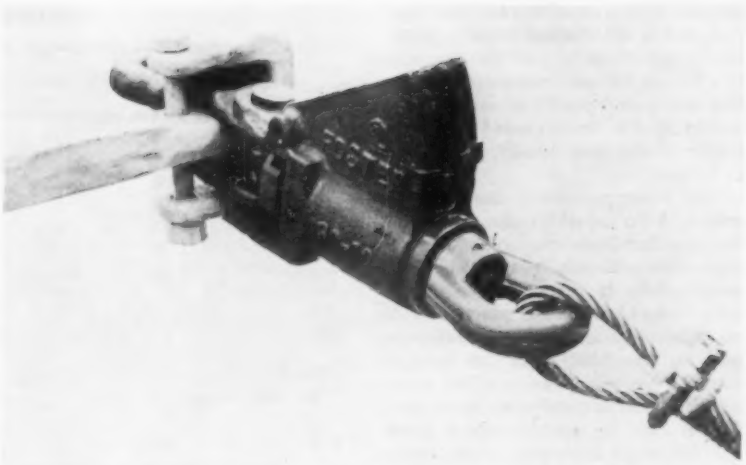
Laboratory work also has pointed up the importance of torque in the performance of rotary shouldered connections. The fatigue strength of a connection in bending is approximately three times as great when it is properly shouldered as when it is not shouldered at all.

Controlled Makeup Torque Tests

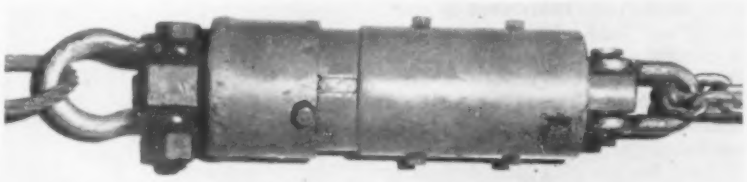
Several tools have been developed for the control of makeup torque. Extensive tests were made to evaluate controlled makeup torque. The results of these tests are tabulated in Appendix I. This work was done in Scurry County, Texas, where an extensive development program was in progress. Each well was drilled from approximately 1,700 to 7,000 ft. with the same string of collars and they were inspected at the completion of each well.

The pin-and-box connections were rejected for further use because of fatigue cracks, leaks, wobbles, galls, or deformation. Improper torque either causes or contributes to all these troubles.

Over-all, the drilling operators, who established an instrumented procedure for torque control, were able to reduce their connection troubles 65 per cent. It was 69 per cent in the case of the pins and 62 per cent for the boxes. Admittedly, attention was being given to other factors that damaged the connections, but all evidence indicates that torque control was the major factor in the improvements noted.



CAM-TYPE TORQUE INDICATOR—A quick disconnect mechanism gives a loud report to driller when preset tong line load is reached. Fig. 3.



SPRING-TYPE TORQUE GAGE—Tong line pull loads a spring and deflection is indicated on calibrated scale which registers in pounds. Fig. 4.

Comparison tests . . . On rigs G and H in Appendix I, an interesting procedure was followed. Drillers were having trouble in estimating the torque. Some of the joints were damaged or failed because of inadequate madeup torque. Others were badly deformed and failures occurred because excessive torque was used. On each rig a torque-indicating device was used for four wells, and then removed on the assumption that the drillers had learned what the proper torque was and could continue to control it.

On Rig G, without torque control, 55 pins or boxes were rejected and reworked in machine shops in a 5-well period. The torque indicating device was used for 4 wells and only 10 connections rejected. The torque indicating device was then removed and with the same drillers estimating the torque, 28 connections were rejected in the course of drilling the next 4 wells.

On Rig H, without torque control, 46 pins or boxes were rejected in a 4-well period. On the next 4 wells the torque indicator was used and only 13 connections rejected. After the torque indicator was removed, the rig drilled two more wells on which seven ends were rejected. This rig was then moved to another area.

Big saving . . . The tests, which involved the drilling of 98 wells, indicated an average of 8.19 pins or boxes were rejected and required machine-shop repair for each well drilled without a torque-control device. For each well drilled using a torque-control device this figure was only 2.77. Based on one operator's figure of $60 trucking and machine-shop expense for reworking a pin or a box, the cost per well, for maintenance alone, was reduced from $491.40 to $166.20, a saving of $325.20.

Far more important was the reduction in fishing jobs which result from failures while drilling. No exact value can be placed on this because fishing jobs from this cause may cost anywhere from $300 to $60,000. It can only be stated that some fraction of such a job, perhaps one-fourth, was saved per well through torque control.

Torque-measuring devices . . . Three different types of devices are currently being used to indicate makeup

torque. These are illustrated in Figs. 2, 3, and 4. All of them actually measure tong-line pull, and torque is a function of line pull and moment arm. For each, compensation is made in setting up the device, based upon the length of the tong handle, to convert to torque.

The assumption that the moment arm will be equal to the length of the tong handle is open to some question. This will only be true when the tong handle is perpendicular to the tong line. However, in practice drillers attempt to achieve their maximum pull on the line when the tong is roughly in this position. The error which results is usually not more than 10 per cent, an amount that is insignificant when compared to the errors made when merely estimating torque.

Tool-joint practices . . . Torque-measuring devices are rarely used in making up tool joints. The torque applied is usually a function of the driller's guess and the condition of the automatic cathead. These catheads are friction-type clutches and may be compared to the brakes on an automobile. We can tell a great deal about how the brakes are acting, and as a result, know that humidity, sand, water, grease, fluid loss, and wear affect them. The action of the automobile tells us.

But, there is no way for the driller to tell how his cathead is functioning. A tong line looks the same with 1,000-lb. tension as it does with 5,000-lb. tension, and the resistance to the hand lever may be the same.

As a result of this lack of control, small-size tool joints (2⅜ and 2⅞ in.) are frequently damaged by excessive torque, the medium sizes (3½, 4, and 4½ in.) give the least trouble because of improper torque, and the larger sizes (5½ and 6⅝ in.) are frequently damaged as a result of insufficient torque.

Improper torque in making up tool joints rarely causes a fishing job. Damage to small joints is usually limited to swelled boxes and upset pin shoulders. The larger joints suffer from washouts which can usually be repaired by refacing the shoulders. These repairs are expensive, but they do not attract the attention that fishing jobs do.

Some means of torque control appears economically justified in the case of the smaller and larger-size tool joints. This might be accomplished either by a torque-measuring device attached to the tong—or possibly by better control at the cathead. Certainly, more work in this direction is indicated.

Drill collars . . . Everyone associated with the problem grants the necessity of properly making up drill-collar connections. In certain areas, where connections are not highly stressed, this is not as important as it is where long strings of tandem collars are used in hard-rock drilling. We will agree that the amount of attention that the problem merits will vary with localities and well depths.

Use of the automatic cathead is the simplest and least accurate method for tonging up drill collar. Automatic catheads of the same size and type show great variations in the tension they can attain in the tong line. Maximum values, depending on conditions and adjustments, vary from 2,000 to 8,000-lb. tension. Assuming a 4-ft. moment arm, this means variations in torque from 8,000 to 32,000 lb.-ft. Most of the catheads tested in recent field checks had maximum tension

APPENDIX I

Quantitative Comparison of Drill-Collar Joint Rejections

Makeup Torque estimated by driller—
vs.
Makeup Torque controlled by driller with help of instrumentation

	Makeup torque estimated			Makeup torque measured		
	Well No.	Pins rejected	Boxes rejected	Well No.	Pins rejected	Boxes rejected
Rig A	1	7	3	3	.....	.....
	2	1	1	4	3	.....
				5	.....	.....
				6	1	1
				7	1	.....
				8	.....	2
				9	.....	.....
				10	.....	.....
Total		8	4		5	3
Per well average		4.00	2.00		0.62	0.37
Rig B	1	6	5	3	1	.....
	2	8	5	4	1	.....
				5	3	.....
				6	1	1
				7	.....	2
				8	.....	1
				9	1	.....
				10	3	.....
				11	4	2
				12	1	.....
Total		14	10		15	6
Per well average		7.00	5.00		1.50	0.60
Rig C	1	1	1	8	.....	.....
	2	2	3	9	2	2
	3	6	5	10	.....	1
	4	.....	7	11	1	.....
	5	.....	6	12	6	2
	6	1	3	13	2	2
	7	3	4	14	2	.....
				15	3	5
				16	2	7
				17	.....	1
				18	.....	1
				19	3	1
Total		13	29		21	22
Per well average		1.86	4.14		1.75	1.83
Rig D	1	.....	1	7	1	2
	2	1	1	8	.....	.....
	3	2	2	9	3	1
	4	9	6	10	3	5
	5	3	4	11	1	3
	6	3	5	12	2	6
				13	.....	2

TABLE 1—VARIATIONS IN LINE PULL WHICH MIGHT BE EXPECTED WITH SPECIFIC NUMBER OF WRAPS AND CATHEADS
(From various field tests—Line pull in pounds)

	Number of wraps				
	2	3	4	5	6
1⅛-in. rope, 12-in. cathead	500-700	900-1,200	1,600-2,000	2,700-3,200	.....
1¼-in. rope, 10-in. cathead	550-950	1,600-2,600	3,500-4,600	4,600-6,200	.....
1¼-in. rope, 12-in. cathead	.....	.....	3,600-3,900	4,800-6,400	5,200-7,100
1½-in. rope, 12-in. cathead	.....	.....	5,000	7,000	.....

APPENDIX I (Continued)

	Makeup torque estimated			Makeup torque measured		
	Well No.	Pins rejected	Boxes rejected	Well No.	Pins rejected	Boxes rejected
				14	2	2
				15	1	2
				16	.....	2
				17	.....	2
				18	.....	.....
				19	2	1
				20	1	1
				21	1	1
Total		18	19		17	30
Per well average		3.00	3.16		1.13	2.00
Rig E	1	7	3	3	1	.....
	2	3	2	4	3	5
				5	2	3
				6	2	4
Total		10	5		8	12
Per well average		5.00	2.50		2.00	3.00
Rig F	1	1	1	3	1	.....
	2	10	12	4	.....	.....
				5	4	.....
				6	.....	3
				7	1	4
Total		11	13		6	7
Per well average		5.50	6.50		1.20	1.35
Rig G	1	3	5	6	2	1
	2	5	1	7	2	1
	3	3	7	8	.....	.....
	4	10	5	9	3	1
	5	10	6			
	10	4	.....			
	11	7	6			
	12	4	.....			
	13	5	2			
Total		51	32		7	3
Per well average		5.67	3.55		1.75	0.75
Rig H	1	2	.....	5	2	2
	2	3	2	6	.....	.....
	3	9	6	7	2	1
	4	13	11	8	4	2
	9	4	.....			
	10	3	.....			
Total		34	19		8	5
Per well average		5.67	3.16		2.00	1.25
Grand total		164	131		87	85
Per well average		4.55	3.64		1.40	1.37

attainable in the range of 4,000 to 6,000 lb.

Use of rope . . . A step in the right direction is the use of a rope on the manual cathead. Table 1 illustrates the results of field tests to determine tong line pull with a rope. Many things influence the result, such as cathead size, a wet or dry rope, the manual effort, rope size, and speed of cathead rotation. If a cathead is mounted too low with respect to the floor, the man on the rope cannot effectively use his weight to help him pull on the rope.

From the table it is apparent that rope size is most important. Note that four wraps with a 1⅛-in. rope may produce only 1,800 lb. pull, whereas four wraps with a 1½-in. rope may produce 5,000 lb. pull. Fairly consistent results can be attained with a 1¼-in. rope. More complete data are needed and further field tests would be helpful.

Some degree of control can be attained by using Table 1. The margin of safety is wider in the "too tight" direction than in the "too loose" direction. Therefore, in selecting the number of wraps to use, the safer choice, if the recommended torque is included in two ranges, is to pick the higher value.

If the torques recommended for the larger collars are to be attained it will be necessary to use a double line with a block attached to the end of the tong handle. This means that the pull on the end of the tong handle is twice the tension in the cathead rope. It is a better and safer practice to use two lines than it is to strain one line near its breaking strength.

More usage . . . Torque-measuring devices are coming into more common use all the time. The Permian basin area is considered the most severe on drill-collar connections and approximately 35 per cent of the rigs are now equipped with devices for control of makeup torque. The trend is indicated by the fact that only approximately 10 per cent of the rig had these devices 5 years ago.

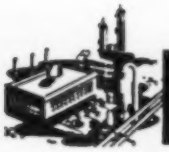
Makeup torque can be controlled within plus or minus 10 per cent of the desired value when a torque-measuring device is used. However, all of these tools are mechanical or hydraulic and subject to loss of calibration or failure. If they are to be used, a systematic recalibration procedure should be maintained.

Bibliography

1. "Causes and Prevention of Drill-Pipe and Tool-Joint Troubles," by H. G. Texter, R. S. Grant and S. C. Moore, World Oil, October, November, December 1948 and January, February, March 1949.
2. "What Do You Know About Drill-Collar Failures?" by Stanley C. Moore, The Oil and Gas Journal, October 26, 1950.
3. "Your Drill-Collar Investment," by H. M. Rollins, The Oil and Gas Journal, October 11, 1954.
4. "Is a Specific Makeup Torque Required for Each Size of Tool Joint or Drill Collar?" by Wiley R. Noble, George J. Gilbert, and Sterling G. Marshall, Drilling, July 1956.

"I finally found out what my wife meant by that 'or else' business."

Part 6



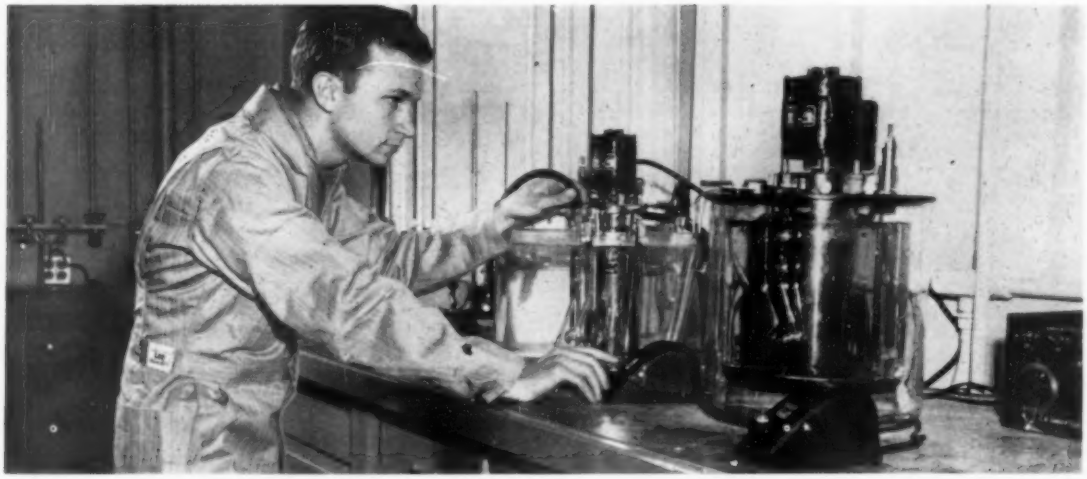
THE FOREMAN'S PAGE

Refining • Petrochem • Natural Gasoline

Laboratory Testing

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—105

Testing Viscosity of Lubricating Oils



A LABORATORY TECHNICIAN tests the viscosity of a motor oil.

VISCOSITY measures the ease with which an oil will flow. A measure of this quality is very useful in lube oils to assure lubrication. This quality also is important in handling heavy oils with pumps, through equipment, and into oil burners, etc.

The three viscosity-control tests used are:

1. Thermoviscosity for gasoline and kerosine.
2. Saybolt Universal viscosity for medium distillates and lube oils.
3. Saybolt furol viscosity for fuel oils and bottoms.

Thermoviscosity test . . . This test is made by putting a small glass tube down in the sample to be tested and measuring the time in seconds required for the oil to fill the tube. The number of seconds multiplied by 10 is the thermoviscosity.

Saybolt Universal viscosity . . . Apparatus for this test consists of an oil bath to control the test temperature at 100°, 130°, or 210° F. In the oil bath is a metal container which holds the sample of oil and controls the flow by a small orifice in the bottom.

The test consists of recording the time in seconds to fill a standard cup with oil while controlling the oil to a standard temperature. The results would read, for example, S.U.s. at 100 = 243.

Saybolt furol viscosity . . . Apparatus for this test is the same used as that used for Universal viscosities except that the orifice, which is mounted in a removable tip, is larger. Also the test temperatures most frequently used for furol are 122° and 210° F.

The orifices in the Saybolt viscosimeters are sized such that an oil at the same temperature when timed on a furol orifice will be about one-tenth of the time required to run through a universal orifice.

Special laboratory tests . . . In addition to the A.P.I. gravity, A.S.T.M. distillation, flash and fire, color, vapor pressure, and viscosity, there are other tests equally important but their applications are confined to specific products and units. Many tests, even though they are in common use for finished products have a limited use in unit operations.

TESTING Saybolt Universal viscosity. The test consists of recording the time in seconds to fill a standard cup with oil while controlling the oil to a standard temperature.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

Tough valve buyers appreciate this kind of...

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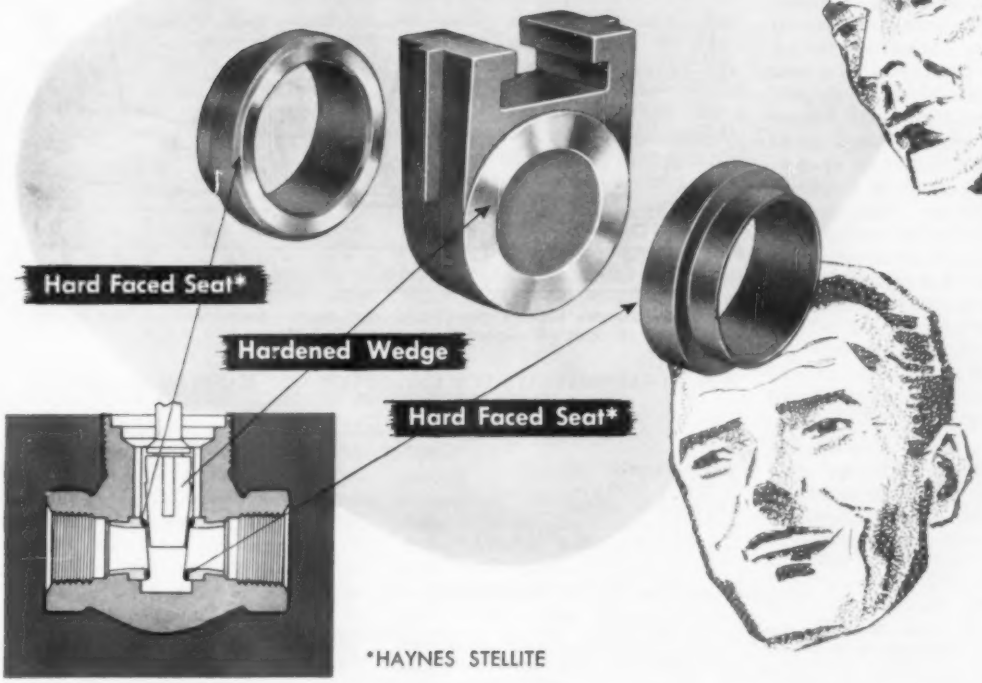

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By W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

What's the Average Cost of Tanker Transportation?

What is the average cost of transportation by tanker? Is it close to the average of the tanker rates which you publish each week in The Oil and Gas Journal? R.S.T.B.

If one made all of his shipments by a series of single charter contracts (spot contracts), the average would, of course, be used. However, spot or single-charter shipments as published in The Oil and Gas Journal are seldom employed except in an emergency, the normal type of charter being a long-term one extending for a year or longer. When a long-term contract is signed, the spot rate at that time is not usually the basis of the contract, but to some extent the rates used in long-term contracts are close to, or are affected by, spot rates. Thus, the average rate for long-term contracts is close to a 12 or 18-month running average of spot or single charter rates.

Finally, most crude oil is handled in company-owned tankers and these can operate at about the following "breakeven" rates (stated as plus or minus percentages of standard

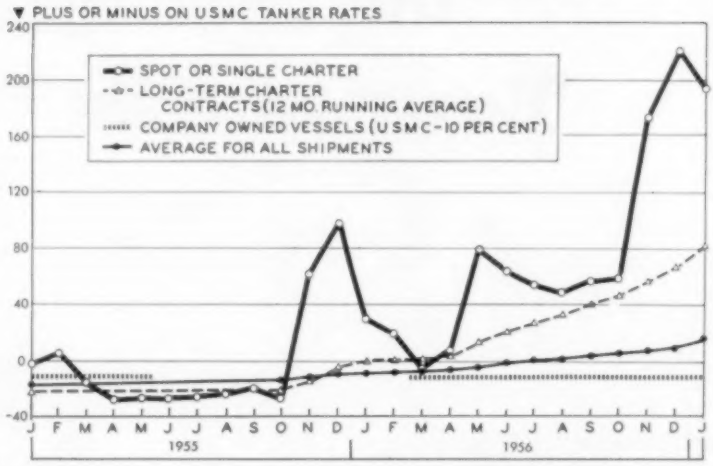
▼ PLUS OR MINUS ON USMC TANKER RATES
240
200
160
120
80
40
0
-40
SPOT OR SINGLE CHARTER
LONG-TERM CHARTER CONTRACTS (12 MO. RUNNING AVERAGE)
COMPANY OWNED VESSELS (USMC - 10 PER CENT)
AVERAGE FOR ALL SHIPMENTS
J F M A M J J A S O N D J F M A M J J A S O N D J
1955
1956

Fig. 1—Relationship between "spot," long-term charter, company-owned, and average tanker rates of crude oil shipped from the Gulf of Mexico to U.S.N.H.

TABLE 1—APPROXIMATE PERCENTAGES OF OILS HANDLED BY VARIOUS TYPES OF CHARTERS, PERCENTAGE

	Crude oil		Products	
	To East Coast*	Longer ranges	To East Coast*	Longer ranges
Company-owned	70	50	50	40
Long-term contracts	30	50	35	40
Single-voyage charter	..	..	15	20

*From U. S. Gulf or N.W.I.

TABLE 2—TANKER RATES DURING 1955 AND 1956

	Spot tanker rates (dirty)				Representative average tanker rates			
	Gulf-U.S.N.H. Spot	±on USMC 12-month	N.W.I.-U.S.N.H. Spot	±on USMC 12-month	Gulf-U.S.N.H. Crude	±on USMC Products	N.W.I.-U.S.N.H. Crude	±on USMC Products
1954 year		−30.5		−40.0				
January 1955	− 1.0	−30.5	−11.0	−40.0	−17.0	−16.0	−22.5	−23.0
February	+ 6.0		+ 4.0					
March	−15.0		−42.0					
April	−27.0		−34.0					
May	−25.0		−36.0					
June	−27.0		−50.0					
July	−26.0		−17.0					
August	−23.0		−34.0					
September	−20.0		−30.0					
October	−27.0	−20.0	−30.0	−30.0	−13.0	−12.0	−20.0	−23.0
November	+53.0	−14.0	+57.0	−22.0	−11.0	− 9.0	−17.0	− 7.0
December	+99.0	− 3.0	+110.0	− 9.0	− 8.0	− 4.5	−13.0	+ 6.0
1955 year		− 2.0		− 5.0				
January 1956	+30.0	0	+20.0	− 7.0	− 7.0	− 4.5	−12.5	+ 7.0
February	+20.0	+ 1.5	−15.0	− 8.0	− 6.5	− 4.0	−13.0	−12.5
March	− 5.0	+ 2.0	− 5.0	− 5.0	− 6.5	− 5.0	−12.0	−10.0
April	+ 8.0	+ 5.0	+45.0	+ 1.0	− 5.5	− 2.0	−10.0	− 0.5
May	+80.0	+14.0	+60.0	+ 9.0	− 3.0	+12.0	− 8.0	+ 4.5
June	+65.0	+22.0	+55.0	+18.0	− 0.5	+12.0	− 5.0	+ 7.0
July	+55.0	+28.0	+45.0	+23.0	+ 1.5	+13.0	− 3.5	+ 7.5
August	+50.0	+34.0	+50.0	+30.0	+ 3.0	+14.5	− 1.5	+10.5
September	+58.0	+40.5	+58.0	+37.0	+ 5.0	+18.0	0	+14.0
October	+60.0	+47.5	+65.0	+45.0	+ 7.0	+20.5	+ 3.0	+18.0
November	+175.0	+58.0	+165.0	+54.0	+10.5	+41.5	+ 6.0	+36.0
December	+221.0	+68.0	+204.0	+62.0	+13.0	+52.0	+ 8.0	+44.5
1956 year		+70.0		+68.0				
January 1957	+195.0	+83.5	+155.0	+79.0	+18.0	+53.5	+13.0	+43.0
February	+170.0	+54.5	+174.0	+89.0	+21.0	+53.6	+16.0	+50.0
March	+174.0	+108.0	+162.5	+102.8	+25.4	+58.9	+20.3	+52.8
April	+33.0	+112.0	+ 5.0	+103.6	+26.6	+39.1	+20.6	+29.4
May	−21.0	+103.0	−39.4	+91.7	+23.9	+27.9	+17.5	+18.7
June	−29.4	+95.9	−41.2	+83.4	+21.8	+24.2	+15.5	+15.5

	Gulf to East Coast	N.W.I. to East Coast	Longer ranges
Large tankers	USMC-40	USMC-50	.....
Close to average	USMC-25	USMC-27½	USMC-35
Most out-of-date	USMC- 5	USMC-15	.....

USMC rates). Some of the new supertankers may be able to operate at even lower "breakeven" rates.

Just how much higher rates than these breakeven rates should be used in obtaining average tanker rates cannot be stated. However, if a 10 per cent profit is reasonable, then 20 per cent should be added to the breakeven rates of ships registered with the U. S. Government, and 15 per cent or less for ships sailing under other flags. This indicates approximate rates (including profit) for company-owned tankers of:

Gulf to U.S.N.H.*	USMC-10 per cent
N.W.I. to U.S.N.H.*	USMC-10 per cent

*U. S. North of Cape Hatteras.

The percentage of oil handled in the three ways, i.e., in company-owned vessels, by long-term charters, and by single-charters, may be somewhat as indicated in Table 1. No great accuracy is claimed for the percentages of Table 1 but it is felt that they are accurate enough for the obtainment of average tanker rates.

Table 2 shows spot rates, longer charter rates and averages based on Table 1 for shipments from the Gulf of Mexico or Caribbean to the East Coast for the years 1955 and 1956. These same tanker rates but for only gulf shipments of crude oil are shown in Fig. 1. Average tanker rates vary scarcely at all (possibly by plus or minus 20 per cent of USMC), long-term charters range more widely but still scarcely more than from minus 25 to plus 80 per cent of USMC rates, whereas spot or single-charter rates can range from minus 35 (or 40) to plus 230 (or higher).

Iso Hydrocarbons in Reformer Gases

. . . A correction

We wish to extend our compliments on your review of platinum reforming in the August 26, 1957, issue. However, one figure is in error. In our over-all practice we find the ratio of iso to normal pertains to average 1.7 rather than the 0.63 stated in the article, and the range extends generally for 1.21 to 2.36 averaging 1.68—J.A.N.

The amounts of iso compounds in platinum reforming gases are approximately as follows:

	%C_5 plus*	iso/normal ratio— Butanes	Pentanes	No. of tests†
Platforming	81.9-91.4	0.714 (0.57-0.95)	1.94 (1.23-2.86)	14
Catforming *	82.0-89.0	1.083 (1.06-1.10)	.....	3
Catforming	.....	1.10	1.70 (1.21-2.36)	(‡)

*Range of data. †From technical literature. ‡Over-all plant operations and range of records

Information on other processes is not available. At this stage of development precise information regarding the composition of gases cannot be given.

Unfortunately in the August 26, 1957, issue, page 129 (Platinum Reforming Yields at High Octane Number), the **i/n** ratio was transposed and in the next to the last paragraph the last sentence should read "The ratio of isopentane to pentane is about 1.23-2.86 for Platforming and an average of about 1.70 for Catforming" (rather than "but only 0.63 for Catforming").

At the same time the reader might note that the octane numbers shown in Fig. 1 of the August 26 issue apply to materials whose midboiling points range from 270° to 330° F. Lower-boiling feeds have much higher octane numbers, and high-boiling feeds have very low octane numbers.

Cost Engineering and Cost Estimating

We have seen notices about the American Association of Cost Engineers. What is meant by cost engineers?—Wm. T. F.

Just how large a field of activity will finally be included in cost engineering cannot be visualized. At the moment the association is most active in the field of cost estimating, and most of the original members are employed in the process industries (chemicals and petroleum) or related contracting organizations.

The estimating of construction and operating costs is little understood by laymen and to some extent even by engineers and technologists. The enormous amounts spent each year for construction (about 4 billion dollars in petroleum refining and the chemical industries) are based on cost estimates, not upon price quotations. Thus, the cost engineer or cost estimator must be able to quickly state the approximmate costs of thousands of items of material and equipment as well as the cost of installing the equipment.

Management must know something about the cost of a project before any money is spent. If the cost determined by the estimator is encouraging, then money may be appropriated for investigation of the development and the determination of more accurate costs. Nevertheless, the cost used in the final contract is usually still an estimate, and actual costs do not become available until purchasing is complete.

Contractors are confronted with an even more difficult situation. They must offer bids on several jobs for each contract that is finally signed. The ratio of proposals to signed contracts may under unfortunate conditions attain even 12:1.

Although a knowledge of costs is needed by the cost estimator, his knowledge of process design and the detail of engineering construction is even more important. He must know how to accomplish all phases of the project, however small, and he must know whether each part of the project is feasible, and what alternate methods may be employed.

Thus, the ideal cost engineer is a graduate engineer in the sense that he has already been a construction engineer, a design engineer, a process engineer, and in many instances he may have had plant operating experience. Large contracting organizations avoid these exacting qualifications to some extent by allowing their cost engineers to rely heavily upon associated departments of construction, process design, engineering design, purchasing, and plant operation.

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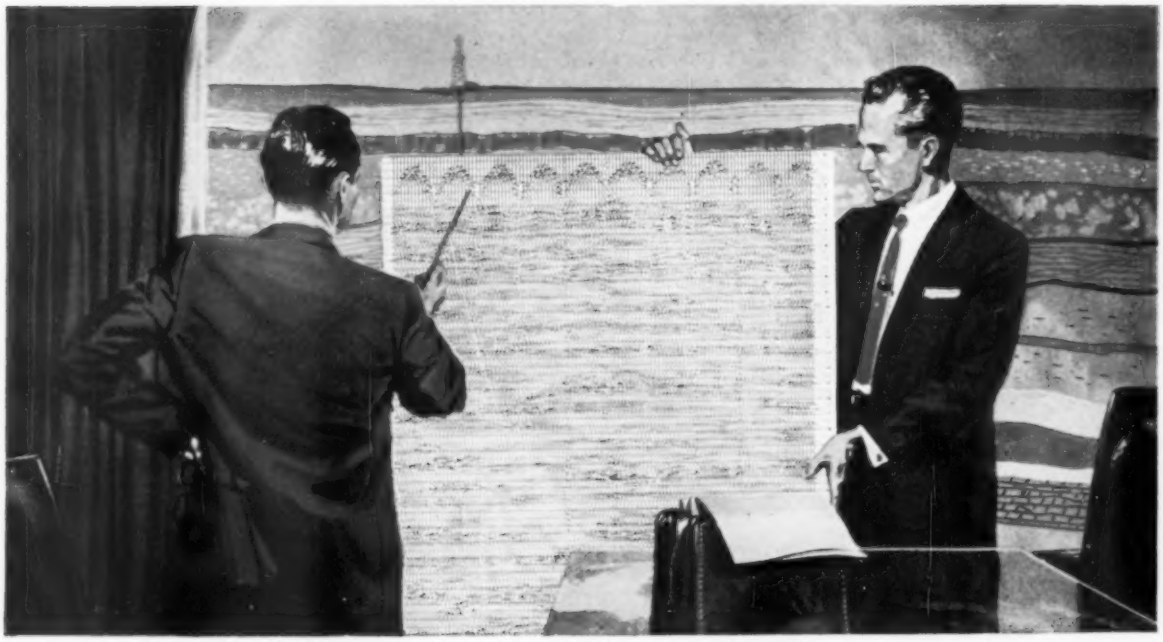
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By Robert L. McIntire
The Datics Corp.

Using Electronic Computers in the Oil Industry — Part 19

Computers Help Design Sulfur-Recovery Plants

ONE very natural application for automatic computing machinery is in the solution of simultaneous nonlinear sets of equations. At first glance, the process-design engineer may believe that such an ability is of little importance to him. Such sets of equations are continually arising in the calculation of process units, however. One such example is in the design of sulfur-recovery plants.

One part of such a design is the calculations associated with the combustion of the acid gas. During this process, the following chemical reactions can be assumed to occur:

$$CH_4 + 3/2\ O_2 \rightarrow CO + 2H_2O$$

$$4CO + SO_2 \rightleftarrows S_2 + CO_2$$

$$4H_2O + 2SO_2 \rightleftarrows 3S_2 + 4H_2O$$

$$4H_2 + 2SO_2 \rightleftarrows S_2 + 4H_2O$$

$$4COS + 2SO_2 \rightleftarrows 3S_2 + 4CO_2$$

$$2CS_2 + 2SO_2 \rightleftarrows 2CO_2 + 3S_2$$

$$CH_4 + 2SO_2 \rightleftarrows S_2 + CO_2 + 2H_2O$$

$$3S_2 \rightleftarrows S_6$$

$$2C + 2SO_2 \rightleftarrows S_2 + 2CO_2$$

$$4S_2 \rightleftarrows S_8$$

For each such reaction, the chemical thermodynamic equilibrium constant is known as a function of temperature. Furthermore, the enthalpy of each chemical species also is known as a function of temperature.

The entire combustion can be computed in the electronic computer if we know the composition of the acid gas and the ratio of air and gas. By combining all of the compositions, it is possible to represent the incoming mixture as some pseudo-chemical compound with the following empirical formula: $C_aH_bO_cN_dS_e$. These subscripts simply represent the relative numbers of atoms of carbon, hydrogen, oxygen, nitrogen, and sulfur which appear in the combined feed.

Flame temperature . . . With this simplification, the computer can be programed to calculate the flame temperature and the composition of the effluent gases. We have now struck home to the process design engineer for these answers are exactly what he needs to know to prepare heat and material balances around his proposed plant.

To solve this problem in the most natural way for the computer, the programer specialist will take a page from work which has been completed in the past by the National Advisory Committee for Aeronautics.[1] The Lewis Flight Propulsion laboratory did a magnificent job of analyzing this particular problem when its solution was needed to calculate rocket-flame temperature.

In general, the procedure consists of reading into the computer information on the initial enthalpy of the feed, the composition of the feed, an assumed flame temperature, and an assumed composition of the effluent. The assumed composition of the effluent gases is limited to only the major components and all minor components are assumed to be zero as a first trial. The machine calculates equilibrium constants at the trial temperature, completes the estimation of the minor constituents and checks the error in material balance. If an error exists, the automatic procedure provides for reestimating the quantities of the major constituents and the entire process is repeated.

Material balance . . . Eventually, a material balance will be attained which is satisfactory. Now, at the assumed temperature, everything is correct. However, the computer now calculates the enthalpy of the effluent to determine if the process was adiabatic. An error which exceeds the desired tolerance here will force a change in the assumed temperature and the program recycles back to the calculation of the revised effluent.

Thus, the computer is capable of performing a trial within a trial (loops within loops). Here, the tremendous power which is available to the computer user begins to take effect.

It is conservatively estimated that one such calculation as the one described would require 2 to 3 weeks of an engineer's time with a desk calculator. A medium-size magnetic-drum machine can complete the work in less than 1 hour.[2] There are no limitations to the number of chemical equations which can be included in the program. For example, if we choose to investigate new regions of temperature in which other species may possibly exist, we can readily modify the program to include these new chemical equilibria.

Sulfur plants . . . We have chosen in this article to discuss this particular flame temperature calculation in terms of the design of sulfur plants. The philosophy of the calculation is equally applicable to other petroleum problems. Many petroleum companies are, today, investigating new chemical processes. In the past, the design engineer resorted to a few calculations with the "water-gas shift reaction" to prove his ideas and suggestions. Undoubtedly, many patents have been issued on the basis of some sketchy calculations.

With the computer as a tool, the engineer may now try to isolate specific areas which show promise before more expensive pilot-plant experiments are performed.

In another area, propellants are becoming more important to petroleum production. With the increased use of jet perforators, this computational tool will be needed to help delineate research objectives during the development of new propellants and perforating tools.

References

1. N.A.C.A. Report 1037.
2. Private communication with the author.

X2 Rods in Third Year in the Pallie Phelan No. 3

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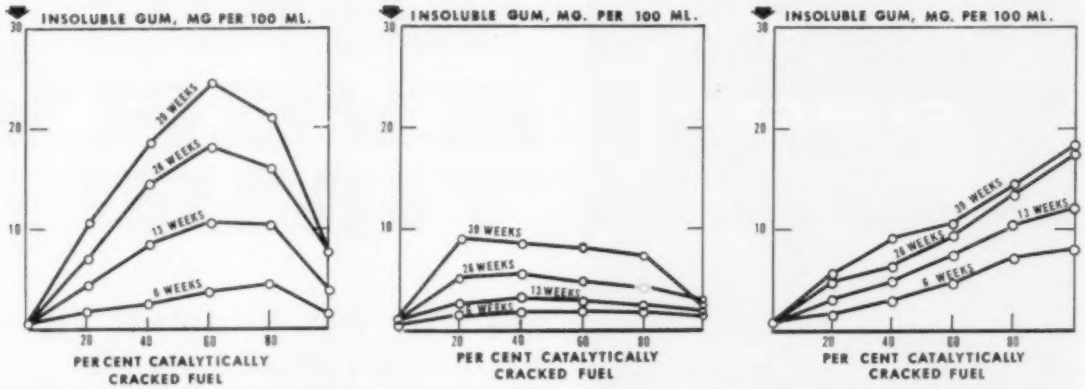
Part 7

Storage Stability

More on Fuel Blends

By F. G. Schwartz and C. C. Ward



FIGS. 7, 8, and 9. These figures show data for several of the 500 series blends of straightrun and cracked fuels. Inspection of the figures indicates that in a blend with straightrun fuel, the percentage of cracked fuel which shows maximum incompatibility varies and is determined by the components blended.

CONTINUING with the results from an examination of the data from the initial storage program, this part of the series on storage stability gives information on 600 series blends of fresh fuels and unfiltered aged fuels.

During a study of the data obtained in the original storage program, the question was raised as to whether incompatibility would occur when a tank containing some stored fuel was filled with fresh fuel from the same source. The 600 series blends were made to answer this question by aging six samples of fuel for 13 weeks at 110° F. and then blending each with an equal volume of the same fuel that had not been aged. Data show that for the six fuels stored there is no marked incompatibility between the fresh fuel and the same aged fuel.

700 series blends . . . These included blends of fresh fuels and filtered aged fuels. The 700 series blends were stored at the same time as the 600 series to determine if the insoluble gum in the blends in the 600 series had catalytic effect on gum formation.

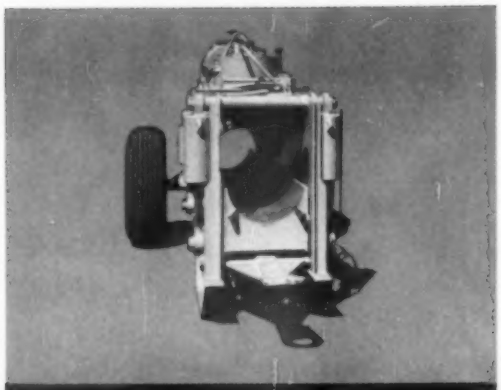
A portion of each fuel was aged 13 weeks at 110° F. and filtered to remove the insoluble gum. It was then blended with an equal portion of a fresh fuel.

Information obtained in the 700 series shows that for a Canadian catalytically cracked fuel, the rate of insoluble-gum formation continues as the same rate in a filtered aged fuel as in the fresh fuel. In every instance the catalytically cracked fuels formed less insoluble gum when blended with a Gulf Coast straightrun than with a western Mid-Continent straightrun. Although these two fuels showed 0.5 mg. per 100 ml. of gum or less when stored separately, the results are not surprising. The Gulf Coast fuel was compatible in most of its blends and the western Mid-Continent fuel was incompatible in most of its blends. The conclusion is that the degree of incompatibility of a straightrun and catalytically cracked fuel blend depends upon the composition of the straightrun as well as on the cracked fuel.

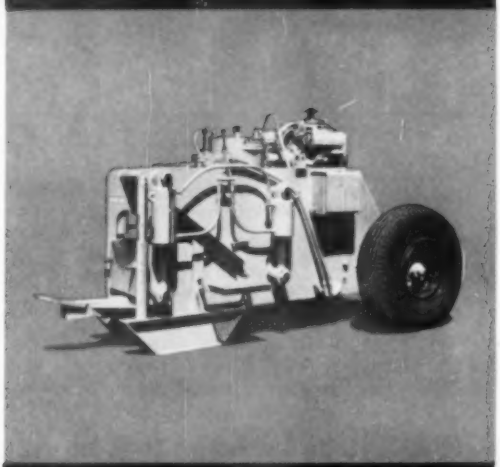
800 series blends . . . These blends are fuels and pure hydrocarbons. Straightrun and catalytically cracked fuel blends have been found to be more incompatible than any other types. The reason for this incompatibility is a solubility effect; or at least that is the proposed theory. The catalytically cracked fuels have a high solvency for gums because of their high percentages of cyclic compounds. When blended with a highly paraffinic straightrun fuel, the solubility is reduced enough to result in the precipitation of some of the gum.

A series of equivolume blends was prepared with catalytically cracked fuels and pure hydrocarbons to test this theory. Results of these tests will be included in the next part of this series.

Authors are with Petroleum Experimental Station, Bureau of Mines, USDI, Bartlesville, Okla.



CINCH



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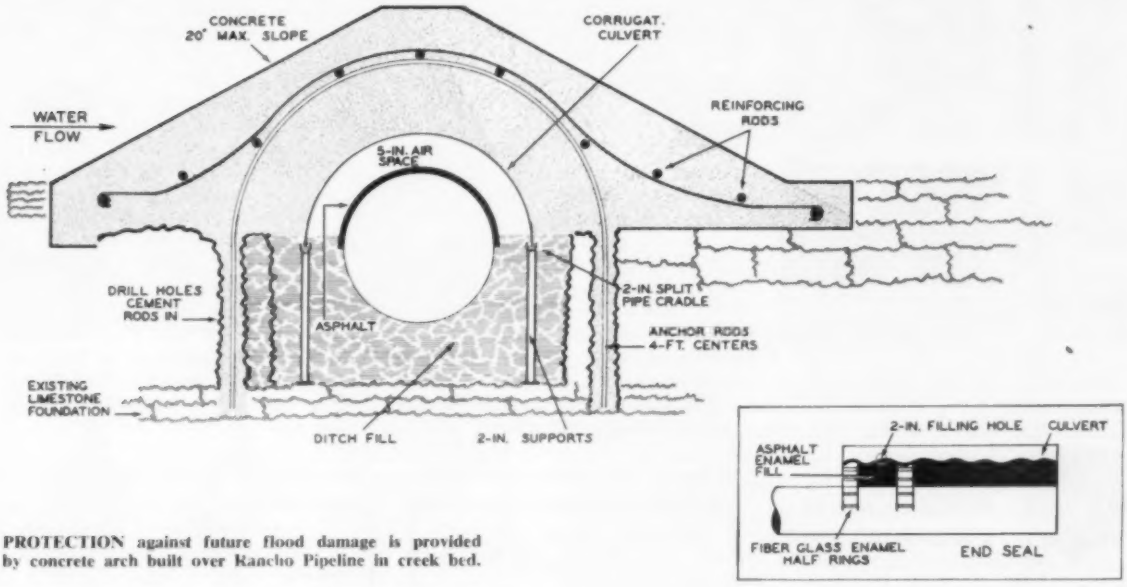


PROTECTION against future flood damage is provided by concrete arch built over Rancho Pipeline in creek bed.

Shell Pipe Line Corp. reduces flash-flood hazard, now . . .

Concrete arch covers line in creek bed

By Larry Resen
District Editor

A CONCRETE ARCH was used by Shell Pipe Line Corp. engineers and maintenance crews to protect an exposed stream crossing the Rancho Pipeline.

The Squaw Creek crossing of the 24-in. crude line near Fredericksburg, Tex., is normally a modest creek bed. However, it is subject to occasional flash floods which are often violent and destructive.

Heavy rains in the area resulted in this flash type of flooding which exposed a section of the pipe, damaged its coating, and left several boulders lodged against it. In repairing the pipe it was desirable not only to restore it to its original condition, but also to protect it from future floods. The original ditch across the stream was blasted out of the limestone bed. This, coupled with the presence of hills on both sides, made it impractical to get slack or lower the line. The engineers decided to build an arch of concrete across the pipe against which boulders or other material could impinge without harming the actual crossing.

Repair work . . . The Squaw Creek crossing is between 45 and 50 ft. wide, and it was decided to extend the protective arch 80 ft. to provide for any future enlargement of the creek bed. The ditch fill was removed from around the pipe to make repairs. This fill was deposited slightly upstream of the pipeline and a diversionary dam built to prevent creek waters from interfering with the work. One-half of the job was completed at a time. Fill used in the first dam was replaced in the ditch and fill from the unworked section was then used to build up a second dam to protect the job site.

Once the pipe covering was repaired, split sections of oversized corrugated-steel culvert were installed around the upper half of the pipe. The two edges of the split sections rested in two cradles especially constructed for this job. Two-inch pipe joints were split lengthwise and then welded to supporting legs also made from 2-in. pipe. These supports, installed on 10-ft. centerline, rested on the limestone bottom of the ditch. The corrugated sections, meanwhile, were cradled in the split section of 2-in. pipe held up by the supports. A 5-in. void was left between the pipe and its concentric half-shield of culvert. Dirt fill was then replaced in the ditch.

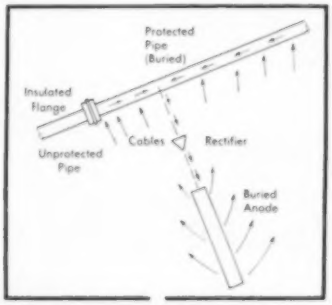
U-shaped tie-down rods were then installed around the culvert on 4-ft. centers. Anchor holes were drilled, the rods inserted, and then concrete poured into the holes to make a solid foundation. The anchor rods do not touch the culvert itself, but extend above it and were imbedded in the concrete arch which was finally poured. Before this was done, a series of reinforcing rods was installed above the tie-down rods. The rods formed a grid the length and breadth of the work to reinforce the concrete so that it could take the impact of boulders and other stream action.

Protective arch . . . Before concrete was poured, a ledge was scraped clear on both sides of and parallel to the line. This provided a solid, smooth anchoring base and form for the concrete. A maximum 20° slope was

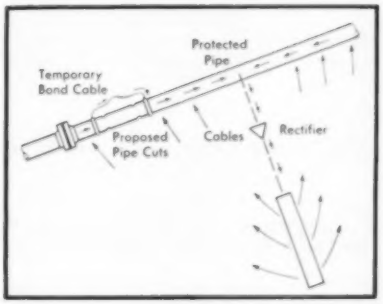
maintained on the upstream side of the top of the arch to insure unimpeded stream flow. The final structure was a reinforced concrete arch which by its design will absorb the impact of overburdens and leave the pipe unaffected since it is not in direct contact with it. The deterioration of the culvert and its cradles will not affect the performance of the arch, for the function of the culvert was merely to serve as a tempopary protection for the pipe and act as a base upon which the concrete could be poured. Once the concrete set, the reinforced arch served as its own support.

The ends of the annulus between the half-section of culvert and the pipe were sealed by the conventional method used in casing programs. The half-rings were built up on each end of the pipe crossing by using several layers of fiber glass and enamel. These half-rings were spaced 1 ft. apart and the void between them filled with asphalt enamel, poured through a small access opening made in the corrugated culvert. This seal protects the pipe against intrusion of water.

Shell Pipe Line Corp. is operator of the Rancho Pipeline which is owned in undivided interests by Shell, Ashland Pipe Line Co., Crown-Rancho Pipe Line Corp., Nantucket Pipe Line Co., Service Pipe Line Co., Phillips Pipe Line Co., and Sinclair Pipe Line Co.



Current is transmitted from rectifier to buried anode by cables. Fig. 1.



Temporary bond cable to connect pipe on each side of proposed cut prevents arcing. Fig. 2.

Cathodic Protection Safety Planning

Various ways to protect workmen

COMMERCIAL alternating current is the most common type of power used in cathodic protection of pipelines, and it presents the greatest potential hazards. Because direct current is needed to protect pipelines, alternating current is converted to direct current, usually through a rectifier. As shown in Fig. 1, the current is transmitted from the rectifier to a buried anode, or ground bed, by cables.

The current, as it is being picked up by the pipeline, prevents corrosion. The current thus picked up must return to the rectifier by traveling through the pipe to a drain cable connecting the pipe and the rectifier.

The current being impressed upon a pipe in this way causes a potential change in the protected pipe by making the pipe more negative with respect to the ground and any unprotected structures.

Arcing . . . Voltages in the d.c. circuits are usually too low to cause bodily harm to anyone who might come into contact with them. But due to the potential differences, it is quite possible for an arc to occur if the protected pipe were suddenly connected to an unprotected structure by some electrical conductor.

If for example, at an insulating flange, the pipe on one side of the insulator is protected while the other is not, a potential difference may

Digested from a paper by Charlie D. Ozanich, corrosion engineer, Southern Pacific Pipe Lines, Inc., presented before Southern California Oil Industry Regional Safety Conference, Western Oil and Gas Association.

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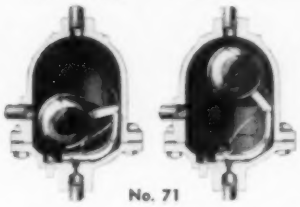
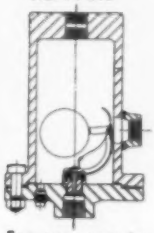


No. 71

Spring holds valve tight until float buoyancy overcomes spring pressure. Then spring snaps up, opening valve wide. Before all water leaves trap, valve snaps closed.

FORGED STEEL No. 71-315



For pressures to 1000 lbs. Same mechanism as No. 71.

How to Select TRAPS

Free Bulletin 289 gives complete selection data on ball float traps for draining water *and light liquids*. Ask for your copy. No obligation.

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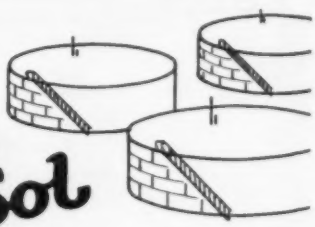

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exist between the two. In this case, a workman laying a wrench or a pair of pliers across the two halves of the flange could cause an arc to occur. If this were to happen in an area where explosive vapors were present, it could be disastrous.

Insulating flanges are often installed in gate boxes where a leaking flange or valve could cause gases to be trapped, and they are often located at pump stations, tank farms, and refineries at the terminus of the line. Gases are common in these areas so caution must be used to avoid an explosion.

Some companies paint their insulating flanges to denote that it is an insulator, other companies wrap their insulating flanges with plastic tape or other material to prevent accidental shorting of the flanges. Southern Pacific Pipe Lines, Inc., coats its buried flanges with Bitumastic and wraps exposed flanges with plastic tape to prevent accidental shorts.

Temporary bond cable . . . Another hazard that stems from pipe potential differences is that of cutting a line which is under protection. When the cut is made, the pipe on one side of the cut will remain protected, while the other side will suddenly become unprotected. With the sudden potential difference, an arc may occur.

Turning the rectifier off is not enough. It may help to reduce the arc, but the pipe may retain enough potential for an arc to occur. The proper solution to a situation of this type is to provide a temporary bond cable to connect the pipe on each side of the proposed cut before any cut is made as shown in Fig. 2.

The cable should be large enough to provide a good low-resistance path for the current and to carry safely the full current load. This cable will provide a continuous path for the current so that when the cut is made, the pipe on both sides of the cut remains protected, there is no potential change and no arc can occur. A heavy welding cable makes an excellent temporary bond.

Bonding clamps must be installed on clean pipe to provide a tight low-resistance connection. Ready-made clamps are available from several manufacturers. The cable should remain in place until the pipe is welded back into place, because an arc can also be caused by joining a protected section to an unprotected section.

High voltage lines . . . The alternating current side of the system probably presents the greatest hazards. High-voltage power lines carrying current to the rectifiers quite frequently are constructed along the pipeline right-of-way. Many times, where a telephone line exists along the pipeline route, the power lines are strung on the same poles with the telephone wires. These power lines create one of the greatest hazards to pipeliners.

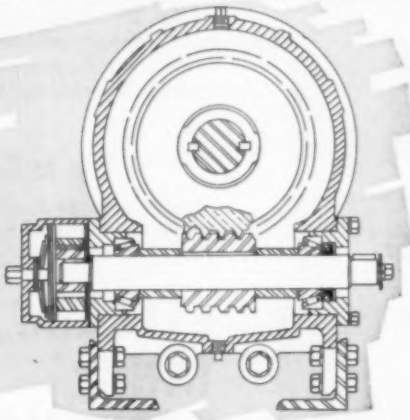
Extreme care must be taken while making pipeline repairs to be sure that truck A-frames or other equipment are not operated too near the power lines.

Assuming that all rectifiers are properly installed, there are two danger zones. One is within the rectifier itself. To remove the hazard, keep a padlock on the rectifier cabinet door and be sure that no inexperienced personnel is allowed to work on a rectifier.

The second and probably most hazardous spot is the safety switch which should be padlocked also.

BRADEN TRUCK WINCHES

Here's Where QUALITY Tells . . .



The BRADEN worm gear is made of solid bronze alloy (on light and medium duty models), and solid bronze alloy cast around solid steel hub (on heavy-duty models). The shell type worm is made of hardened and ground, special treated alloy steel.

These two gears, the heart of the mechanism of the winch, are engineered to give an extra margin of safety should the operator load the winch beyond its rated capacity.

BRADEN Truck Winches are made in capacities from 6,000 to 100,000 pounds. Specify BRADEN Winches . . . and be sure!

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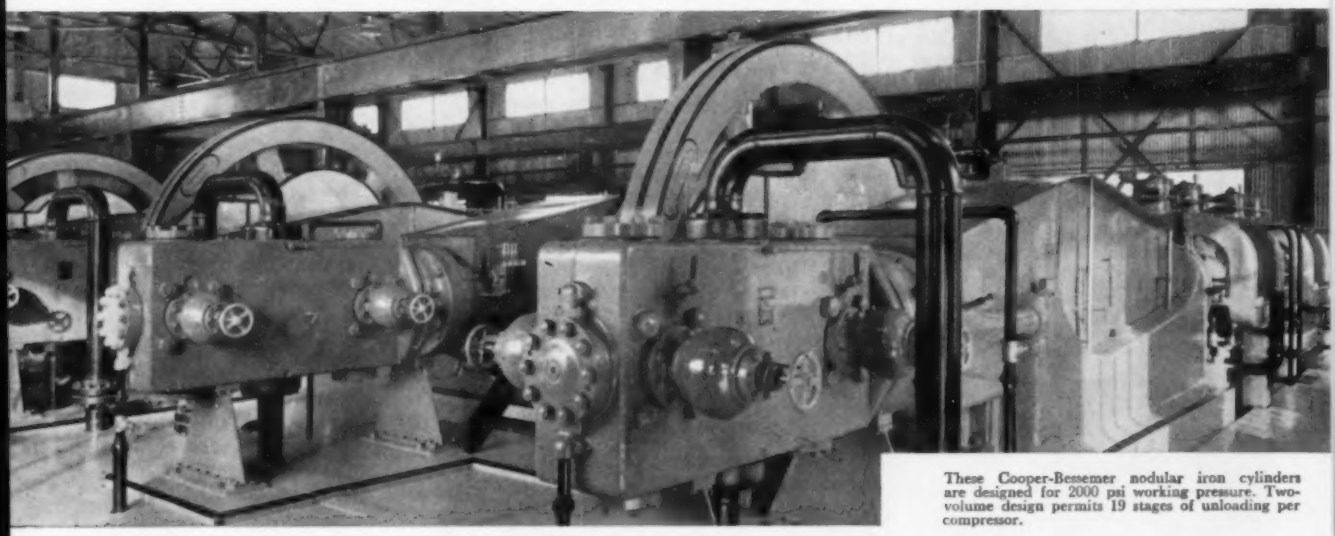


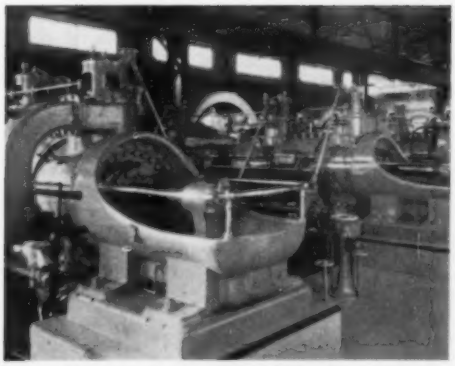
These Cooper-Bessemer nodular iron cylinders are designed for 2000 psi working pressure. Two-volume design permits 19 stages of unloading per compressor.

COOPER-BESSEMER ADDS "NEW LIFE" TO OLD COMPRESSORS

At the Rockport and Ripley compressor stations of United Fuel Gas, Charleston, West Virginia . . . nodular iron cylinders have "up dated" 25 to 30 year old Cooper-Bessemer twin-tandem horizontal compressors.

These new Cooper-Bessemer nodular iron cylinders provide greatly increased flexibility while keeping the units at full capacity over a wide range of pressure conditions. Gas to storage is handled at 620 to 685 psi suction and 1000 to 1800 psi discharge. Delivery from storage is at 300 to 700 suction and 800 to 950 discharge.

If you are open to ideas on cutting costs and improving the efficiencies of your older compressor installations, be sure to check with Cooper-Bessemer.



Cooper-Bessemer Type-22 engines in the United Fuel Gas Company's Ripley, West Virginia station.

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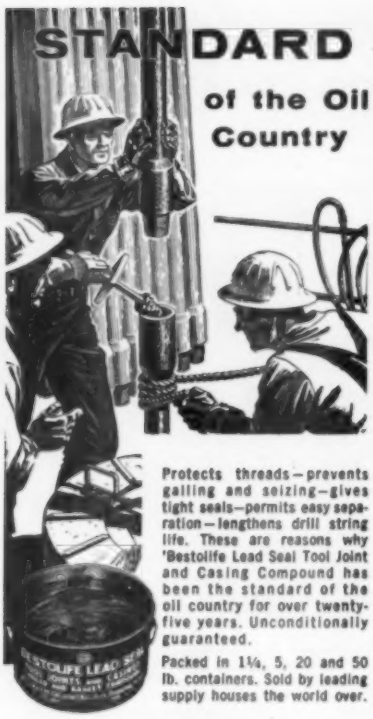

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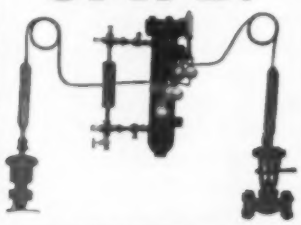

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Among the Drilling Contractors

Trinidad Light Rig Drills 21 Wells in Year's Time

A light rig operated by Sellier Drilling Co., of Trinidad, B.W.I., has made an unusual drilling record for that area. In the year's time it has been running, it has drilled 21 wells, totaling 69,988 ft. of hole. Holes ranged in depth from 2,506 to 5,002 ft., averaging fractionally more than 3,332 ft. Moving time between holes varied from 2 to 5 days.

The rig was a National T-20 assembly, powered by a General Motors 12107 Twin 6 engine, and having two C-150-B slush pumps.

Nicklos Drilling Co., Houston, has contracted for an 8,850-ft. wildcat test in southern Pointe Coupee Parish, South Louisiana. It will be drilled for **Norton Drilling Co.,** of New Orleans, whose location, at 1 Louisiana National Bank of Summers, in 33-6s-8e, is about 1½ miles south of Fordoche field.

Webster Drilling Co., Houston, will drill an 8,950-ft. test in the Savoy area, western St. Landry Parish, South Louisiana. It is a partnership deal with Webster as contractor and joint operator with Trunkline Gas Co. Location, at 1 Agnes Brown, in 15-6s-1e, is about 1½ miles northwest of Savoy field.

Douglas Drilling Co. is on a new operation in the North Cankton area, southern St. Landry Parish, South Louisiana. It is drilling for Drew Cornell, Inc., of Lafayette, La. Current test is 7 Gardner, in 48-8s-4e. It is a 4,500-ft. contract.

Rhodes & Hicks Drilling Co. has a rig under contract to Lyons & McCord and Corbett Stovall for a 5,500-ft. well to be drilled in Al Smith field, 7 miles northeast of Alice, in northeastern Jim Wells County, South Texas. It will be the operator's 1 Embleton.

Jett Drilling Co., Shreveport, is under way on a deep wildcat test in southern Lincoln County, Mississippi, it has contracted to drill for Texas Pacific Coal & Oil Co. The test, 1 Moak-Carruth, in 35-5n-7e, is about 15 miles south of Brookhaven, and near the Pike County line. It is 5½ miles west of Sweetwater field, where production is from Tuscaloosa sand about 10,700 ft. The new operation is projected to 11,000 ft.

Eagle Drilling & Development Co., Natchez, Miss., has a new contract job in the Levees Creek area, in southeastern Adams County, southwestern Mississippi. It is a 6,850-ft. Wilcox test for Germany, Gulmon & Callon at 1-A Drane, in 20-5n-1w, about a half mile south of production.

Justiss-Mears Drilling Co., Jena, La., is drilling on a new H. L. Hunt wildcat test in the Sandy Bend area of LaSalle Parish, Central Louisiana. Location, at 5-F Louisiana Delta, in 12-5n-3e, is about 1½ miles west of production at Sandy Bend. It also is about 2½ miles north of North Big Island field. Objective is Wilcox sand abou' 5,500 ft.

Maxwell Herring Drilling Co., Kilgore, Tex., is getting started on a deep test it has contracted to drill for E. A. Carter, of Dallas, at a wildcat location 3 miles west of Tyler, in Smith County, East Texas. Permit for the test, 1 Morris, is for a depth of 10,000 ft., which would take the hole to the Rodessa horizon. Spot location is in the Maragaret Brown Survey.

A. W. Thompson, Inc., Houston, will drill a 12,600-ft. Devonian test for Sinclair Oil & Gas Co. at a wildcat location 15 miles southwest of Lovington, in central Lea County, southeastern New Mexico. Sinclair's location, 1 State Lease 403, in 22-18s-34e, is about 1¾ miles southwest of Reeves-Pennsylvanian field, nearest production. A **Kincaid & Watson** rig will drill Sinclair's 2 State Lease 401, a 6,500-ft. San Andres test in Section 21, about a mile east of the Thompson deep operation.

C. G. Glasscock Drilling Co., Corpus Christi, will do the drilling on an offshore wildcat test Continental Oil Co., as operator for the C.A.T.C. group, is undertaking in Block 70, West Delta area, in the Gulf of Mexico about 25 miles off the coast of Plaquemines Parish, Louisiana. Location is on OCS lease 0182 (State Lease 534). Permit calls for a 14,000-ft. test.

Honaker-Davis Drilling Co. has a new rank wildcat operation in northern

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Hamilton County, in far-western Kansas. Its contract with Kansas-Nebraska Natural Gas Co., the operator, is for a 5,500-ft. test. Location, at 1 Wedel, in 1-22s-41w, is 13 miles north of Syracuse. Nearest production is in Patterson pool, 15 miles east at the north end of the Hugoton gas area.

El Dorado Drilling Co., El Dorado, Ark., is drilling on a new Smackover test well of shallow production in the old Smackover field, in northern Union County, Arkansas. It is a contract job for E. G. Bradham, also of El Dorado. Location, at 1 Sam Smith, in 2-16s-17w, is about 2¾ miles northeast of nearest Smackover production, in Bear Creek field. Objective is expected around 6,000 ft.

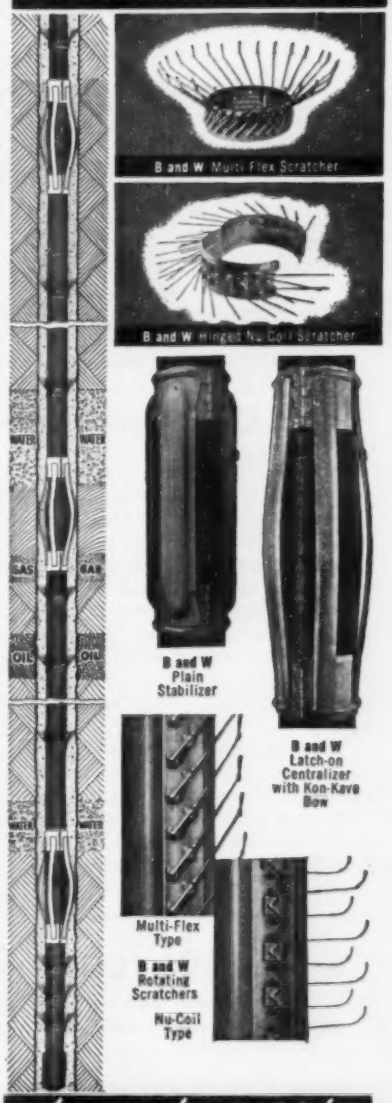
United Drilling Co., Longview, Tex., is keeping a rig working for Lyons & Logan, of Shreveport, in Southwest Slocum field, 2½ miles northwest of Salmon, in Anderson County, East Texas. Present operation is a confirmation test for the operators' recent Woodbine oil-discovery. The new test, 1 Reese, in the William Sims Survey, has a 6,100-ft. permit. The Woodbine discovery well is productive at 5,818-23 ft.

Owen Drilling Co., Lafayette, La., has a new wildcat operation in the Ellis area, northwest of Crowley, in Acadia Parish, southern Louisiana. It is a projected 13,000-ft. test for Midwest Oil Corp. at 1 Lawson, in 7-9s-1e. Location is about 1¼ miles east of production in Ellis field. It is about a half mile south of a 10,280-ft. dry hole it drilled earlier this year as a joint venture with Midwest.

Atlas Drilling Co. is scheduled for a 12,000-ft. test to be drilled for Russell Maguire, of Houston, in northwestern Beauregard Parish, southwestern Louisiana. Maguire's operation is at 1 Crawford in 17-4s-12w. This is just across Sabine River (state line) from Bon Wier field, in Newton County, Texas. It is 5 miles southwest of Merryville field.

Penrod Drilling Co., Shreveport, will drill another deep test in the area southeast of Buras, in Plaquemines Parish, Louisiana, where it now is completing a prospective discovery well for Hunt Oil Co. and Pan American Petroleum Corp. The second test is for the same operators at 2 L. L. & E. Co. Both locations are in 42-20s-30e. The first test, set up to go to 15,000 ft., is being completed at total depth of 13,380 ft.

B and W SCRATCHERS AND CENTRALIZERS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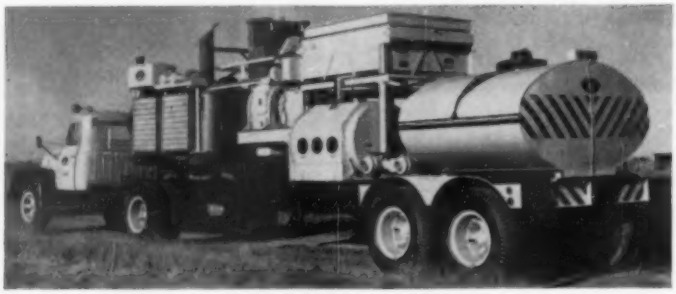


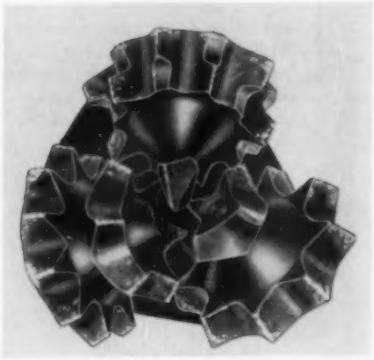
Pump Unit Gives Wide Operating Range

Outstanding features cited for this new pumping unit include an Allison aircraft engine driving a 6½ by 8 triplex pump through a single-stage torque converter and a two-speed drive between the converter and the pump. The drive gives a pumping range from 2⅓ bbl. per minute at 6,000 psi. to 20 bbl. per minute at 1,500 psi. An air clutch in the drive line permits shifting the two-speed drive when necessary.

The engine cooling system uses ethylene glycol and water. This coolant is circulated through a horizontal cooler.

A hydraulically driven updraft fan carries the heat away from the operator. Lubricating oil circulates through two coolers. These, too, have automatic shutters. During hot weather, both coolers operate, but one is enough in most winter weather. When operating at maximum efficiency, the unit is expected to deliver 752 hydraulic horsepower.

An operator can start, stop, and control the pump unit by a pneumatic-electric control system without moving from his station. An automatic control shuts off the engine if it overspeeds. A pumping-rate meter with cumulative and reset volume counters is also provided. It indicates pumping rate in both gallons per minute and barrels per minute. **Write or call: Ventex, Inc., P. O. Box 33, Addison, Tex., for details on pump units.**



Drilling Bit Gives Fast Penetration

The long, strong teeth on this new K-4 drill bit deliver maximum penetration in such low compressive-strength strata as soft shales, broken shale, clays, red beds, salt, shells, and soft limestone, the maker claims. The cones are offset 6° from the apex to give a tearing, twisting, and gouging action without heavy weights.

The maker recommends the bit for weights from 1,000 to 3,000 psi. and rotary speeds from 65 to 150 r.p.m.

It is made in sizes of 4½, 4¾, 7⅞, and 7⅞ in. **Write or call: Oil Tool Mfg. Co., Inc., P. O. Box 712, Tonkawa, Okla., for details on K-4 bit.**

●

Shaft-Mounted Drive Comes in Large Size

This new high-capacity all-steel 315J Falk shaft-mounted drive is available in a single-reduction ratio of 5:1 and in two double-reduction ratios of 14:1 and 25:1. Unit ratings range from 2 hp. at 5 r.p.m. to 50 hp. at 359 r.p.m. The maximum torque rating at the low speed shaft is 31,000 lb.-in. A long center distance between shafts permits the use of large sheaves on installations where the unit mounts with the input shaft toward the driven machine or on through-shaft applications.

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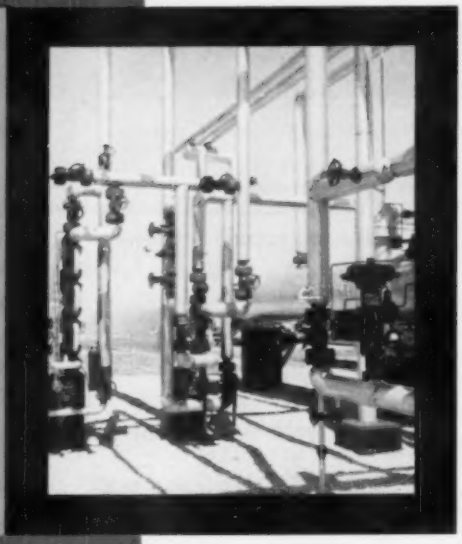
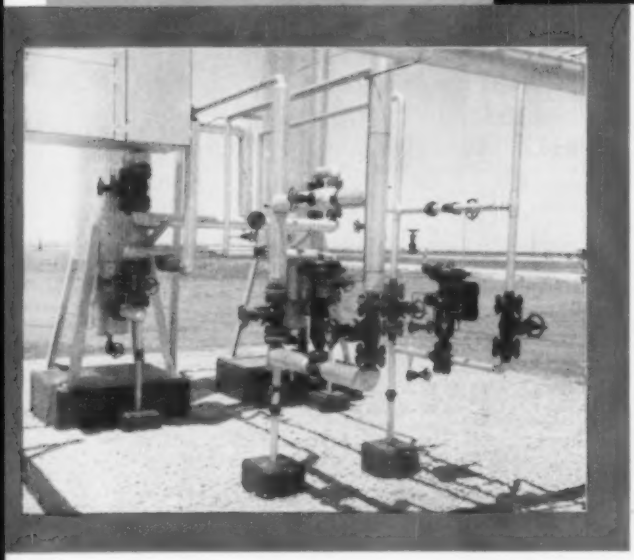


ABOVE
Left to right, de-ethanizer feed, bottoms exchanger, and liquid level control valve.

LEFT ABOVE
Propane dehydrators in right foreground. In background, plant process pump area.

LEFT
Propane dehydrators



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WEST COAST REPRESENTATIVE: Fred P. Koenig Company, Long Beach, Calif., 3815 Atlantic Avenue, GArfield 4-3834

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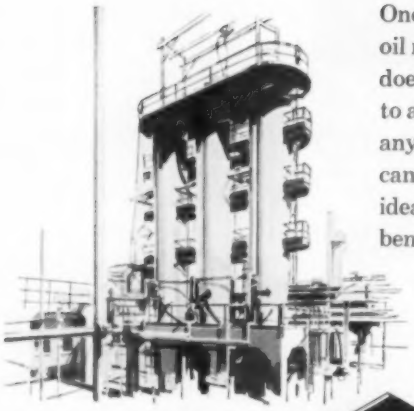

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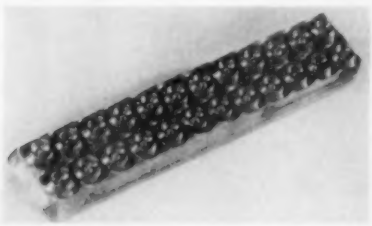

Tong Die Cuts Drill-Collar Wear

This Safe-T-Grip die is designed to minimize slippage and to reduce repairs to drill collars and tool joints, the manufacturer says. The die is of a standard length and width. But its holding surface differs from that of a conventional die. The surface is made up of a series of sharp circular edges with a cone point in the center. This design is said to reduce considerably the cutting and galling of drill collars and tool joints.

The manufacturer reports that field tests show the die will last from 8 to 10 times longer than a conventional die. **Write or call: Turner Tools, Inc., P. O. Box 4128, Fort Worth, Tex., for details on Safe-T-Grip die.**

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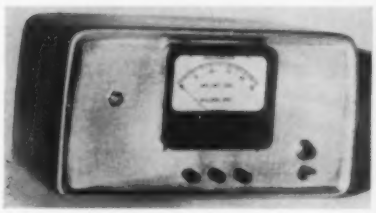


Sensitive Indicator Measures Voltage Change

Accurate measurement and continuous indication of rates-of-change at values too slow or too small for conventional measuring methods is offered by this new electro-mechanical computer, the maker reports. It's called the Deltameter.

An output signal representing milli-

TRADE MARK
TIME TESTED
MACCO
GAS LIFT
REG. U.S. PAT. OFF.

MACCO DUAL COMPLETION EQUIPMENT
"Capsule" Mandrel and CM1 (1" O.D.) Gas Lift Valve

The "capsule" type mandrel is available from stock for all standard dual, macaroni, and slim-hole lift. Special sizes are manufactured upon request. With the valve and check valve mounted inside, this type of mandrel provides extra large flow areas for the well fluids. The producing zones of parallel or concentric dual completions may be simultaneously lifted by either a "common" or "separate" gas supply. Macaroni tubing lowered inside of the regular tubing has proved a highly successful means of lifting wells where it is objectionable to pull the regular tubing. Efficient lift inside of small liners is also made possible.

The Macco fluid operated valve is particularly suited for dual completion lifting. A typical installation consists of separate, parallel strings of tubing, each equipped with Macco fluid operated valves mounted in capsule mandrels. The fluid of each zone controls the opening and closing of its valves. The casing annulus serves as the gas supply for each string of valves. Valve interference is eliminated and each zone is lifted independently of the other. No surface equipment other than a choke in the gas input line is needed.

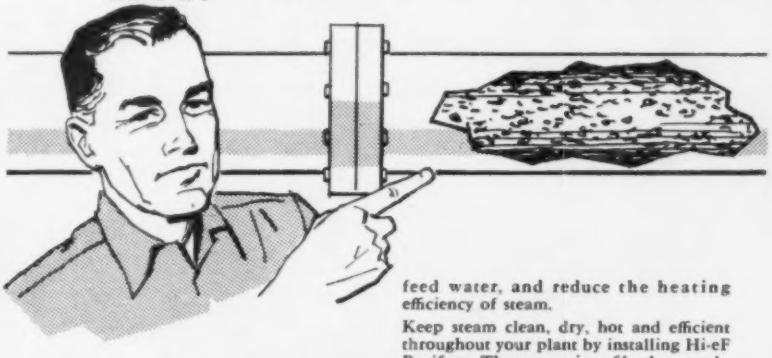
Macco manufactures many different types of dual completion equipment to fit any well requirement. For further information, write for Brochures No. 3-12, 3-21, and 3-31.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253

CM1

Worried about WET DIRTY STEAM?



We don't blame you for worrying about wet, dirty, or oily steam. It can damage engines and turbines, slow up production processes requiring steam, contaminate feed water, and reduce the heating efficiency of steam.

Keep steam clean, dry, hot and efficient throughout your plant by installing Hi-eF Purifiers. These amazing, filterless scrubbers take out all mist, dirt, oil and slugs. Patented design assures virtually 100% purification. A truly maintenance-free scrubber. Write for complete details today.

ANDERSON Hi-eF PURIFIERS

THE V. D. ANDERSON COMPANY
division of International Basic Economy Corporation
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Company_____
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City_____ Zone___ State_____

FREE... Purification Booklet

T F

TAYLOR

Welding nozzles

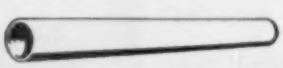
T.E.M.A. flanges and channels

Multiple outlet headers

Production forgings

Venturi reducers

Spiral weld pipe



Large diameter electric weld pipe

Welding necks

For utmost value

FORGE Welding Fittings and Forged Flanges

Whether it's a "heavyweight", like the big special wall thickness WeldELL pictured here, or a Schedule 5S Stainless Steel "lightweight"—in fact *any* thickness, size or type of Welding Fitting or Forged Flange—you can be sure of utmost value if it's made by Taylor Forge.

In 57 years of specialized forging experience we've learned how to make metals do precisely what we want them to do . . . how to form them to exact dimensions . . . how to control grain flow so as to put extra strength where it is needed . . . how to maintain great accuracy and finest quality in everything we make from the smallest to the largest unit.

All of this is just another way of emphasizing the fact that Taylor Forge Welding Fittings and Forged Flanges can be depended upon to meet your most exacting requirements . . . to provide utmost value.

So . . . remember . . . for everything in Welding Fittings and Forged Flanges . . . every size, type, thickness or pressure rating . . . every forgeable material . . . it pays to turn to Taylor Forge . . .

TRADITIONALLY DEPENDABLE

For prompt, efficient and reliable service, patronize your local Taylor Forge Distributor.

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General Offices and Works: P. O. Box 485, Chicago 90, Illinois
Plants at: Carnegie, Pa., Gary, Ind., Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada
District Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Seattle, Toronto, Calgary, Montreal.

New Equipment

volts per second is visually shown on a calibrated meter. The signal may be fed into a recorder or a controlled system. Input voltage may represent such variables as pressure, temperature, pH, light intensity, velocity, or contact potential.

In operation, the instrument samples a voltage pulse at a given time and stores it. Later, it records a second sample and simultaneously compares it with the first. The time interval between the two samples is precisely controlled. A voltage change in the order of a few parts per 10 thousand is well within the normal sensitivity. And the over-all accuracy is 2 per cent or better, the maker claims. **Write or call: Dept. MD, Miljan, Inc., P. O. Box 396, Paramount, Calif., for details on Deltameter.**

•

Utility Type of Vehicle Travels Rough Terrain

Over rough or smooth terrain, this new Utilicar can be handy for either transportation or hauling, says the maker. Operated by either an 8½-hp. gasoline engine or a d.c. motor, it reportedly provides the power and stability needed for use on rough, s'oping ground. It will travel over snow, ice, mud, sand, and wet grass, the maker claims.

Its three tires measure 16 by 15 by 6 in. Their air pressure is 7 psi.

The vehicle is 42 in. wide, 95½ in. long, and 44 in. high. The gas model weighs 750 lb.; the e'ectric model 800 lb. Pay loads are 750 lb. and 700 lb., respectively.

The transmission has a high, low, and reverse gear. Maximum speed is 18½ m.p.h. for the gasoline-powered model and 14 m.p.h. for the electric. **Write or call: Atwood Vacuum Machine Co., Rockford, Ill., for details on Utilicar.**

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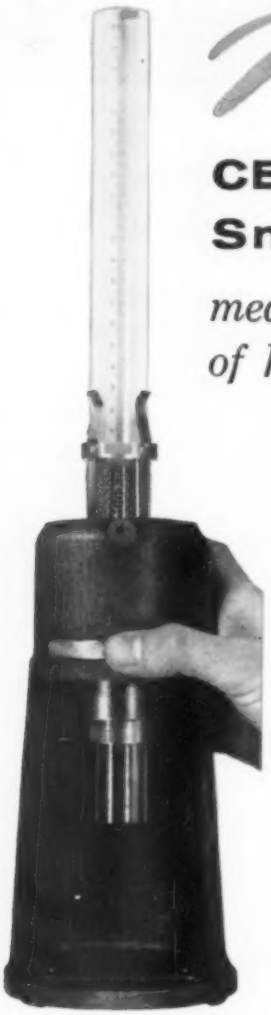

New!

CENCO–INDIANA Smoke Point Lamp

measures burning quality of hydrocarbon fuels

Here at last is an accurate measuring device for determining the burning qualities of a wide range of hydrocarbon fuels. Licensed to CENCO for commercial manufacture and sale under the patent rights of Standard Oil Company (Ind.), this instrument provides utmost sensitivity in the range where fuel-quality requirements fall. Smoke point is the maximum flame height in millimeters at which the fuel to be tested will burn without smoking. With increased emphasis on reducing carbon deposition of heating oils and jet engine fuels, this equipment fills the need for a precision method of specifying burning quality of fuels over a much wider range than previously possible.

Consists of a base with housing enclosing a new improved flame height control mechanism and oil reservoir holder, oil reservoir, and a graduated "Pyrex" brand glass chimney.

Order today for prompt delivery

No. 27312 CENCO-INDIANA Smoke Point Lamp. Complete with two chimneys and six 6-inch wicks, each $125.00

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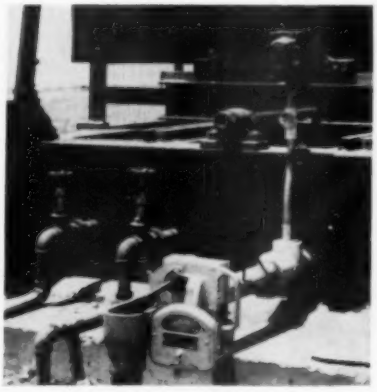


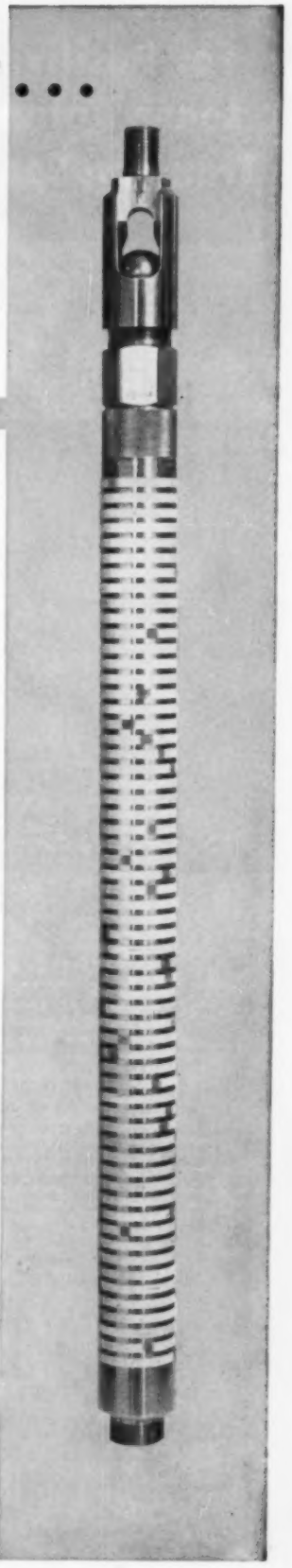
Multirange Ammeter Helps Size Pump Motors

Here is a new portable and lightweight multirange thermal-demand ammeter. It can be used by field engineers and foremen to determine the correct size of electric meter for oil-well pumping-unit service. Called the Max-I-Meter, it also can be used to measure the maximum ampere demand on distribution transformers.

The Model MIM-200 unit combines a thermal-demand ammeter and an instantaneous ammeter. These can be used for the adjustment of the pumping unit counterbalance or to indicate overloading of the meter. Readings obtained also can be used in power-factor calculations.

Metal to Metal Wear...

is the real villain in sucker rod pump troubles. It accounts for most of your repair and pump pulling expense.



The Martin Idea...

for getting away from this trouble has always been to make use of the best available materials — *Natural Rubber* for the key material in plunger rings; *Synthetic Rubber* for the key material in resilient ball guides for cages.

The accurately grooved and drilled metal body of **The Martin Plunger** does not touch the barrel. Only the resilient rubber and duck rings contact the barrel. This material — with its great natural resistance to abrasion as well as its slipperyness-when-wet — has a much slower wearing action on the barrel. Most often your barrel will not need replacing. These rings have an amazing ability to take the kind of abuse that goes with oil well pumping, and this means longer runs. Plunger cost is reduced because replacing the rings costs only about one fourth as much as a new plunger, and this saving is, of course, added to the barrel saving and longer runs.

Patent No. 2,591,174

The Martin Rubber Guide Cage protects the ball from all metal contact except when it rests upon its seat. The ball is protected to such an extent that ball and seat life is usually doubled. The synthetic ball guide and stop cannot beat out because of its resilience. Its life is therefore much greater than any metal and you get this longer cage life in addition to better ball and seat life. The two guides are easily replaced when the occasion does arise.

No real capital outlay is required to get these benefits because the cost of Martin Plungers and Martin Cages is very much the same as you are now spending for replacements — sometimes less.

All regular or stroke-thru ROD PUMPS and TUBING PUMPS can be equipped with Martin Plungers. Martin Rubber Guide Cages are made in all sizes and styles. Write for our catalog No. 4; also see Composite catalog for 1956-57.

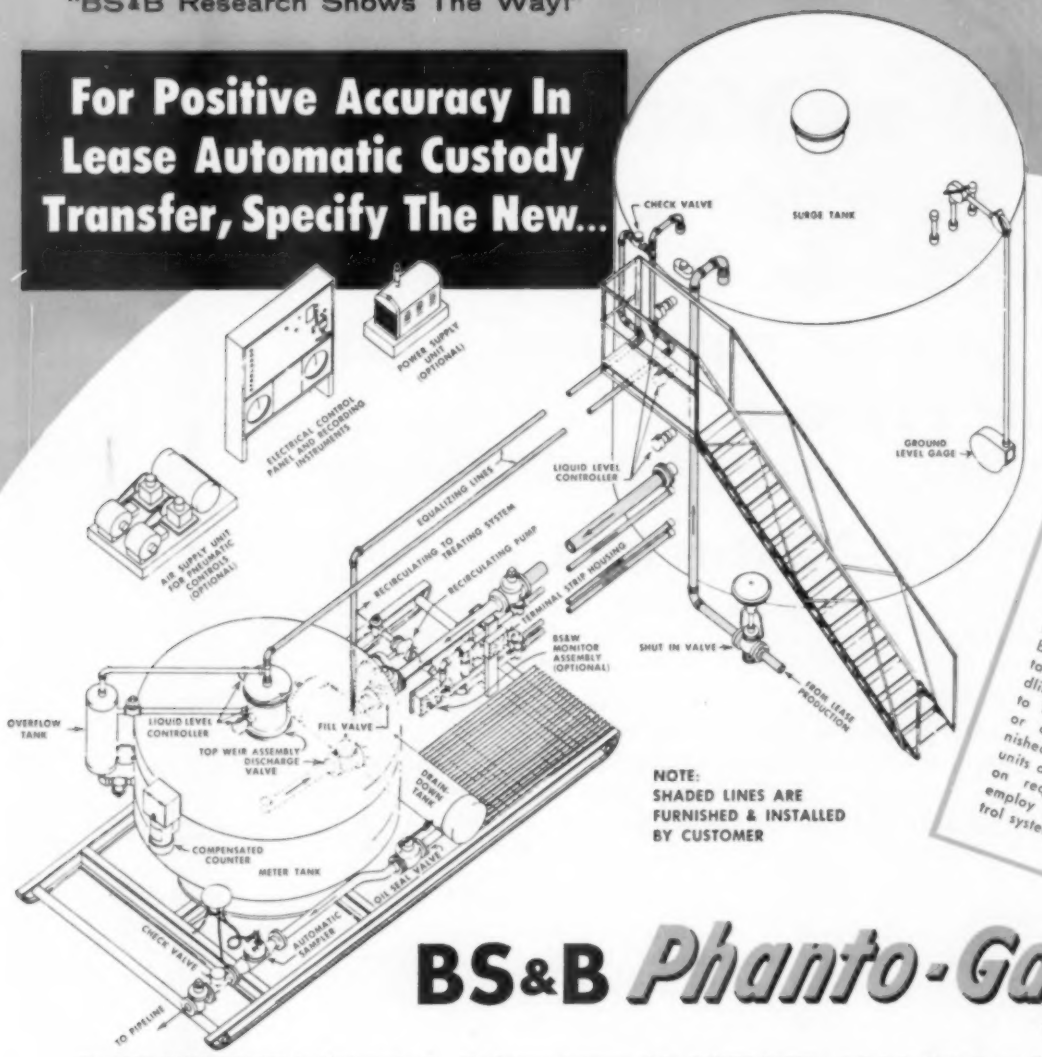
JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.

"BS&B Research Shows The Way!"

For Positive Accuracy In Lease Automatic Custody Transfer, Specify The New...



NOTE:
SHADED LINES ARE FURNISHED & INSTALLED BY CUSTOMER

PHANTO-GAGER VOLUMETRIC METER TANKS ... are available as standard in 25 and 50 bbl. sizes, but larger tanks capable of handling production of up to 1,000,000 bbls./day or over can be furnished. Smaller sized units are also available on request. All units employ standard control systems throughout.

BS&B *Phanto-Gager!*

The BS&B PHANTO-GAGER is that part of BS&B's new PHANTO-MATIC Lease System which automatically performs all the functions normally required to accomplish Lease Automatic Custody Transfer. It will:

1. Automatically measure and record temperature compensated oil volume in bbls.
2. Automatically measure (or automatically sample and subsequently determine) oil quality and contaminants.
3. Automatically run crude oil from a lease into connecting pipeline in accordance with predetermined schedules (if required) on an unattended basis.

The Extreme Accuracy of the PHANTO-GAGER is such that the purchaser or his agent is assured of receiving the *exact* amount of gross oil indicated by each recorded run because:

1. The upper weir on the meter tank and the degassing time when the oil is above the weir on filling are designed to give a positive high level gage.
2. The use of a valve between the meter and the drain down tank, plus a set drain down time, gives a positive low level gage.
3. The accuracy of measurement is not affected by the speed of valve action.
4. The meter tank and lines included in the calibrated volume are free of gas traps while filling, liquid traps while emptying.

Fail Safe Controls on The PHANTO-GAGER insure that no oil will be lost in case of power failure because:

1. The fill and empty valves on the meter tank are electrically interlocked.
2. Oil cannot be introduced into the meter tank after the measuring cycle has started, nor can oil be removed from the meter tank (other than to the pipeline) after the top gage has been made and before the run is completed.
3. All electrical controls, motors, instruments and wiring within 150 ft. of the meter and surge tanks are explosion proof.

Together, the BS&B PHANTO-GAGER and the BS&B PHANTO-PUMPER (which automatically performs all lease operations ahead of the PHANTO-GAGER) make up the complete BS&B PHANTO-MATIC Lease System. This gives the lease operator full automation from the wellhead to the pipeline. Ask your BS&B Man to give you full details, or write to...

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.
Oilfield Equipment Division, Dept. 1-A10A
P. O. Box 1714
Oklahoma City, Oklahoma

SHOWCASE . . .

New Equipment

Simple to operate, the ammeter allows field men to increase pumping efficiency and lower the cost of pumping operations, the maker says. **Write or call: HD Electric Co., 760 Osterman Avenue, Deerfield, Ill., for details on Max-I-Meter.**

●

Adjustable Wrenches Can Reduce Wrench Inventory

The number of wrenches needed for shop, oil field, or pipeline service can be reduced with just two of these OTC Slim-Twin adjustable wrenches, the maker reports. The two wrenches replace 42 fixed-jaw wrenches, with consequent savings in cost, space, weight, according to the maker.

Removable and adjustable, the jaws give $\frac{1}{16}$-in. adjustments from $1\frac{7}{16}$ to $4\frac{3}{4}$-in. openings, using both wrenches. Each opening is safety locked with a nut and bolt.

The wrenches are available in two sizes—24 and 36 in. The long model, with optional two jaws, handles work from $1\frac{7}{16}$ to $2\frac{1}{8}$ in. It withstands 3,500 lb.-ft. of torque and weighs 10 lb. The 36-in. long model has a jaw opening from $2\frac{1}{8}$ to $4\frac{3}{4}$ in. It withstands 10,000 lb.-ft. of torque and weighs 22 lb. **Write or call: Owatonna Tool Co., 396 Cedar Avenue, Owatonna, Minn., for details on Slim-Twin wrenches.**

●

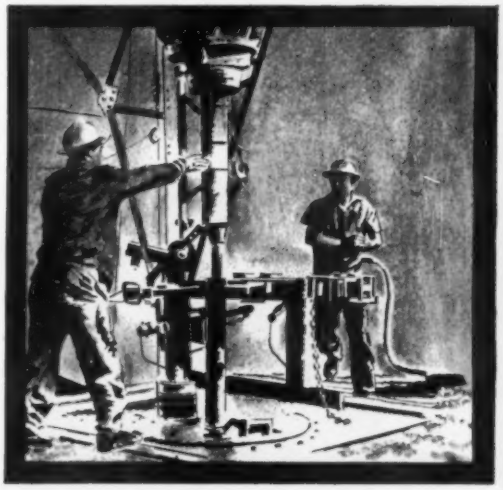
Electronic Gaging Gives Levels of 100 Remote Tanks

Here's a new transistorized electronic system for measuring the level of liquid in any of 100 remotely located storage tanks. Called the Data-Gage, the system was designed and developed to control inventories, quickly and accurately, in such installations as tank farms, the maker reports. But it can be used wherever liquids are stored in large tanks.

Comprising the major components of the system are a receiver console, field selector unit, and liquid-level gage. The system may be installed at the tank site. Or the receiver-console may be located in a remote office at any distance from the tanks.

Direct wire, telephone, carrier, or microwave transmission may be employed. Up to 100 tanks or stations may be monitored on a single system, with liquid depth up to 64 ft. in each tank. Accuracy of measurement is $\frac{1}{16}$ in., the maker says. The system may be installed without taking a tank out of operation. **Write or call: Texas Instruments, Inc., Box 7045, Love Field, Dallas 9, Tex., for details on Data-Gage.**

TWO MILES DOWN—



that's where performance really pays off—and where YUBA BARITE pays its biggest dividends.

A consistently high quality weight material available any time of the day or night from strategically located distribution points.

Production facilities are located at:
Emeryville, California. Fresno, California.
Southgate, California. Salt Lake City, Utah.

YUBA MILLING DIVISION

METALS DISINTEGRATING COMPANY, Inc.

GENERAL OFFICES: Dept. B, Elizabeth B, N. J.

SHOWCASE . . .

New Equipment

Portable Drilling Rig Used for Soil Sampling

Among the uses for this new Dri.l Scout portable drilling rig are shallow-well drilling, soil sampling, and subsurface and foundation testing. Readily moved over rough terrain, the unit will handle drill-bit sizes from 1⅞ to 4½ in. It will take cores in sizes from 1⅜ to 1⅝ in. Larger core barrels are available for soil testing.

The unit provides a power package with all components mounted on one frame. It may be mounted on a Jeep, truck, or trailer. For fast setup, all adjustable parts are hinged or telescoped and locked in position with safety pins. They can be positioned for drilling in a few minutes, the maker claims.

A hydraulic lift raises the tower to a drilling position and lowers it to traveling position. The frame is of 2½-in. welded tubing. An Onan 12.9-hp. two-cylinder air-cooled gas engine powers the rig. **Write or call: Gustafson Mfg. Co., Inc., P. O. Box 2409, Corpus Christi, Tex., for details on Drill Scout.**

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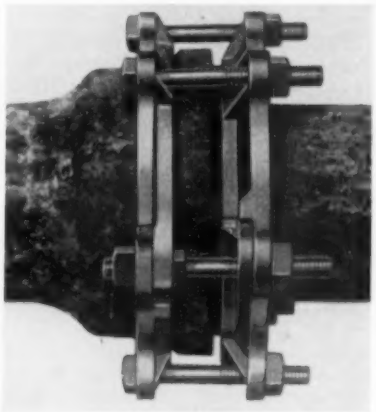
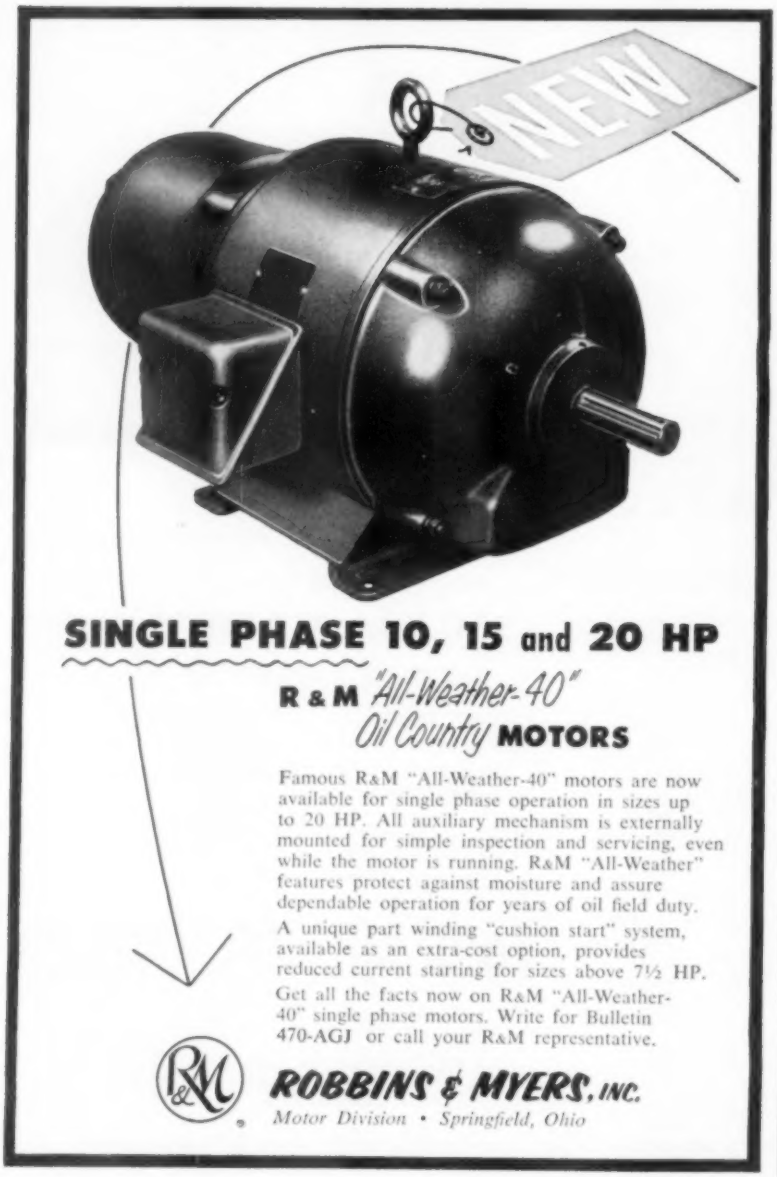
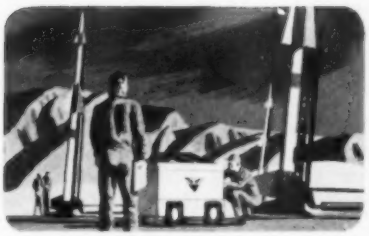


Bell-Joint Clamp Gives Tight Seal

This bell-joint clamp is now available in sizes from 4 through 30 in. According to the maker, bell and spigot joints can be made tight before the bolts are fully drawn up. This feature provides a high factor of safety.

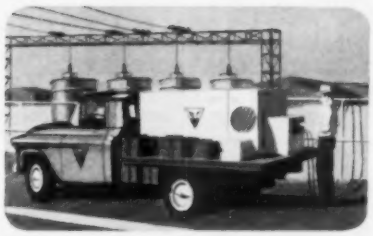
The clamp consists of two segmental malleable-iron rings, a combination single-ring gasket made of two hardnesses of rubber, and a set of clamping bolts. The soft-rubber portion of the gasket quickly seals off the leak in the bell-and-spigot joint. The harder outer portion of the gasket engaged by the spigot ring resists cold flow and holds the gasket under permanent pressure. **Write or call: Joslyn Mfg. & Supply Co., Wm. E. Pratt Foundry Div., 155 North Wacker Drive, Chicago 6, Ill., for details on bell-joint clamps.**


NEW
SINGLE PHASE 10, 15 and 20 HP
R & M "All-Weather-40" Oil Country MOTORS
Famous R&M "All-Weather-40" motors are now available for single phase operation in sizes up to 20 HP. All auxiliary mechanism is externally mounted for simple inspection and servicing, even while the motor is running. R&M "All-Weather" features protect against moisture and assure dependable operation for years of oil field duty.
A unique part winding "cushion start" system, available as an extra-cost option, provides reduced current starting for sizes above 7½ HP.
Get all the facts now on R&M "All-Weather-40" single phase motors. Write for Bulletin 470-AGJ or call your R&M representative.
R&M
ROBBINS & MYERS, INC.
Motor Division • Springfield, Ohio

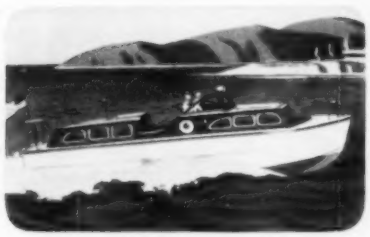


Missile Applications

Ground Support for Jet Aircraft

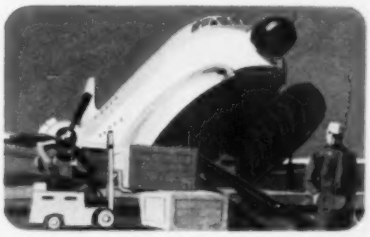


Portable Power Generation

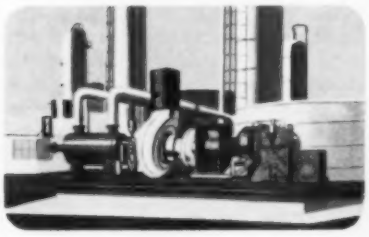


Small Boat Propulsion

Portable Fire Pumps



Auxiliary Power for Aircraft



Turbine Drives for Process Pumps

Power for One-Man Helicopters

Emergency Stand-by Power

Here are nine Solar gas turbine uses! Can you think of more?

SMALL-SIZE SOLAR GAS TURBINES offer a radical new power concept for forward-looking businesses. Their easy portability, high power-to-weight ratio and reliability make them ideally suited for applications beyond the scope of conventional engines. They are easy to maintain, start instantly after long periods of inactivity and can burn a wide variety of fuels—including gasoline, kerosene, diesel oil and others.

Shown above are only nine of the many uses for these new prime movers—and additional applications are limited only by the imagination. To date more than 1000 Solar gas turbines have been sold. They are serving 35 different customers in more than 50 applications. Current production models—the 50 hp Mars® and 500 hp Jupiter®—are being turned out in volume for a growing list of satisfied military and commercial users. And development work on a new 1000 hp Saturn engine is going forward.

For more than a decade Solar has been making important contributions in the gas turbine field. Whatever your business, whatever your special power needs, perhaps a versatile Solar gas turbine can provide the answer. For a new gas turbine brochure, write to Dept. D-96, Solar Aircraft Company, San Diego 12, California. *Designers, developers and manufacturers of gas turbines, expansion joints and aircraft engine, airframe and missile components.*

SOLAR
AIRCRAFT COMPANY
SAN DIEGO
DES MOINES

ENGINEERS WANTED. Unlimited opportunities, challenging projects, good living with Solar! Write for brochure.

Campbell Chain

GOES BIG WITH ANY RIG!

"Measure-Mark" Chain

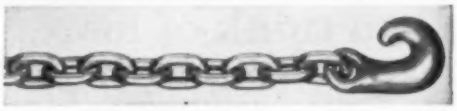
CAM-ALLOY and CAMPBELL HIGH TEST STEEL

Exactly marked every 5'. Color-coded for instant grade identification. Standard footage in every pack—color-coded labels with inventory control. **Cam-Alloy** features *extremely* high tensile strength—excellent resistance to wear—light weight for given load. Look for the *orange* "Measure-Mark." Campbell **High Test** Steel Chain is high-carbon steel, heat-treated for high tensile strength and maximum resistance to abrasion. Short links give maximum flexibility. Look for the *blue* "Measure-Mark."

BOOMER CHAINS

Made from Cam-Alloy or High Test Steel Chain with Grab Hook each end, 20 feet long. Supplied bright finish. Packed one chain in cloth bag. In dimensions and weights for every job.

WINCH LINE CHAINS



Made from High Test Steel Chain, heat-treated for increased resistance to wear and shock loads. Tagged for size and length. Bright finish. In dimensions and weights for every job.

TRUCK TIRE CHAINS

Available in 3 grades: *Lug-Reinforced* for maximum traction and wear, *Mud-Service* for off-the-road use, *Highway Service* for general use . . . single pneumatic and dual triple.

CAMPBELL CHAIN CAMPBELL CHAIN *Company*

Factories and Offices: York, Pa.—W. Burlington, Iowa

WAREHOUSES: Campbell Chain Company, 712 "R" St., P.O. Box #1144, Sacramento, Calif.; 3085 N.W. Front St., Portland 10, Oregon; Wald Terminal Warehouse, 902 Live Oak, Houston, Texas.

WEST COAST SALES MANAGER: D. R. Coutts, 1933 Mission Ridge Road, Box 1175, Santa Barbara, Cal.

TERRITORY MANAGERS: J. N. Kuhl, 7000 S. Shore Drive Hotel, Chicago, Ill.; S. Hardison, 1970 Val Verde, Germantown, Tennessee; S. Adsit, 17 E. 57th St., Kansas City, Mo.; A. E. Vincent, 3917 Thaxton Ave., S.E., Albuquerque, N. Mex.; K. Steinmetz, 1339 Sherwood Road, Glenview, Ill.; D. A. Ruffin, 5623 Boaz St.—Apt. #90, Dallas 9, Texas; G. W. Ferree, 5634 Putnam Drive, Birmingham, Mich.

CONTACT ANY OF THE CAMPBELL REPRESENTATIVES ABOVE FOR COMPLETE INFORMATION ON *ANY* TYPE OF CHAIN—OR HELP WITH A PARTICULAR CHAIN PROBLEM.

SHOWCASE . . .

New Literature

Plastic Compressor-Valve Plates for replacing carbon and stainless-steel plates on compressors in pipeline, refinery, and processing-plant service are detailed in a new four-page folder. According to the folder, the plastic valve plates can increase a compressor's volumetric delivery and reduce strain and wear. The plates are machined from laminated phenolic-resin type of plastic-sheet stock. They are resistant to most corrosive gases, hydrocarbons, and other fluids. The folder gives the plates' mechanical properties and explains how to order them. **Write or call: Plastelite Engineering Co., P. O. Box 412, Fort Worth, Tex., for folder on compressor-valve plates.**

●

Seamless Casing, Tubing, and Line Pipe available from Mannesmann Tube Co., Ltd., Ontario, Canada, are set forth in a new multicolor eight-page brochure. After explaining the beginning of the method of producing seamless tubes from solid iron rods, the brochure explains in basic terms and with simple multicolor drawings the present-day steps in producing seamless pipe from a cold billet. It closes with a listing of available seamless line pipe produced according to A.P.I. Standard 5L and 5LX and seamless casing produced according to A.P.I. Standard 5A. **Write or call: Mannesmann Tube Co., Ltd., Sault St. Marie, Ont., Canada, for brochure on facilities and products.**

●

Plastic Pressure Sensitive Tapes for pipeline protection and corrosion control as well as for electrical applications are detailed in new Bulletin 118. The four-page bulletin gives complete tape specifications and chemical properties. The tape comes in two types. One is a vinyl pressure-sensitive type. The other is a polyethylene pressure-sensitive type. Both can be applied by hand or machine. For the readers' convenience, a pipe-coverage table is included. It shows the squares of tape needed per 100 lineal feet of pipe. **Write or call: Rubber & Plastics Compound Co., Inc., 10 Rockefeller Plaza, New York 20, N. Y., for Bulletin 118.**

●

Rock Bits available in 18 versions are described in a new Oil Tool catalog. The 16-page catalog illustrates each of the bits with two-color photographs showing tooth arrangements and spacing. The bits come in both shale and

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hard-rock types with full or jet-hole water courses. Teeth in all bits are tungsten tipped and hardened for abrasion resistance. According to the catalog, thrust loads on the roller bearings are eliminated. **Write or call: Oil Tool Mfg. Co., Tonkawa, Okla., for rock-bit catalog.**

●

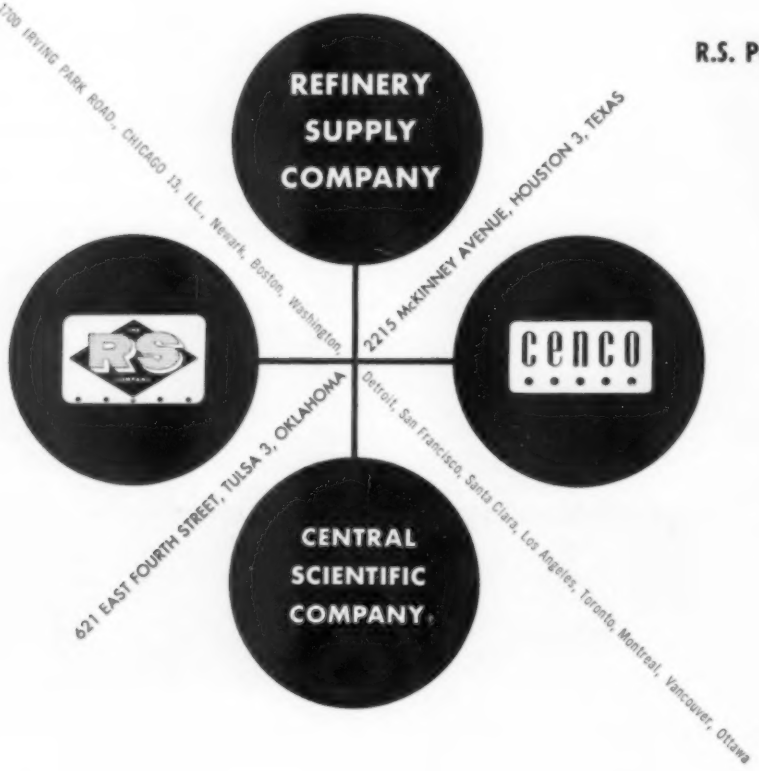
Mud Supplies and Services available from Baroid are fully described in a new multicolor 28-page catalog. Indexed for reader convenience, the catalog first discusses company's facilities for rendering complete drilling-mud services. It then takes up weight materials for drilling mud and the use of colloids to control the filtration rate and to adjust the viscosity and gel strength of drilling mud. Following this, the catalog goes into products for preventing lost circulation, for use in oil-base muds, and for chemical treatment of mud. **Write or call: Baroid Div., National Lead Co., P. O. Box 1675, Houston, Tex., for 1957 Catalog.**

●

Moisture Monitor, the CEC Type 26-301, for monitoring or control of trace quantities of moisture in gases or gaseous mixtures is set forth in new Bulletin 1834A. The bulletin points out the monitor is useful for checking the moisture content of gas at treating plants and in transmission lines as well as for other applications. It describes the instrument's features and explains its principle of operation. According to the bulletin, the instrument accomplishes an analysis by continuously and quantitatively absorbing and electrolyzing all water present in a sample stream entering the instrument. **Write or call: Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif., for Bulletin 1834A.**

●

Wind-Recording System for ranges from 6 to 60 m.p.h. are pictured and described in four-page Form F-457. The text includes suggestions on applications in plant-site investigation, refining, power generation, environmental engineering, and general research and engineering. The brochure contains closeup photographs of the translation equipment which feeds signals from the wind-speed and direction transmitters to the chart-recording units; internal details of the low-drag light-chopper type of anemometer used; and the carrying-case provisions made for portable application of the system when operation beyond power lines is required. The publication also includes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- **Gas pressures on pipe line leakage tests**

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Pipe ends slide quickly into place over tapered rings. Rings expand under fluid pressure.

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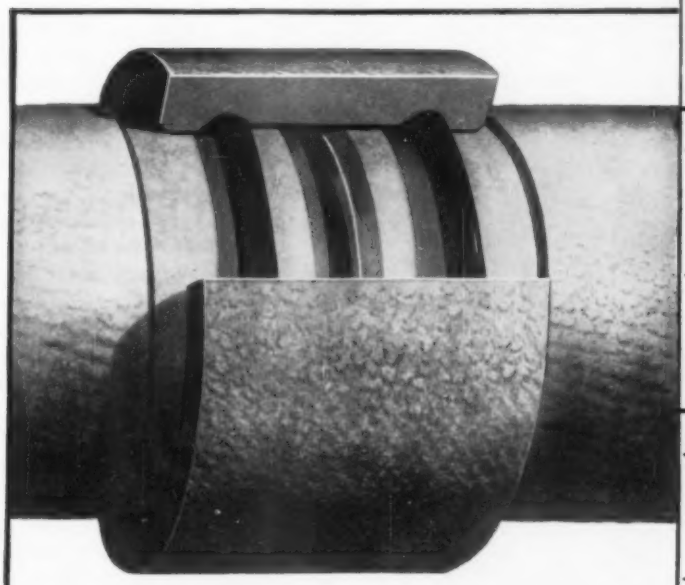
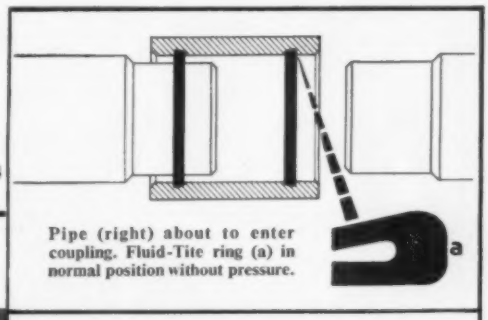
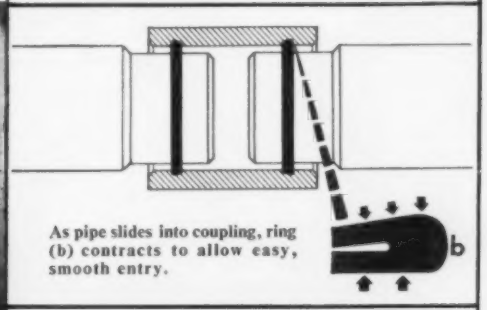


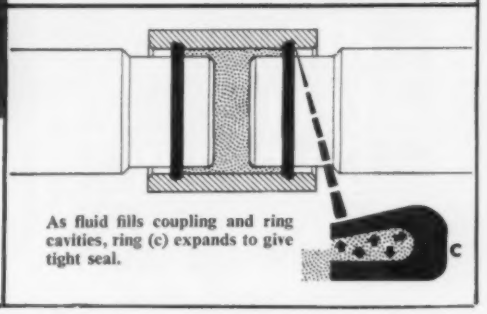
"CENTURY" ASBESTOS-CEMENT "FLUID-TITE" COUPLING (sectioned). Make-up speed results from holes in tapered "Fluid-tite" sealing rings. Holes permit rings to compress, allowing pipe ends to slide into coupling easily and without a special puller.



Pipe (right) about to enter coupling. Fluid-Tite ring (a) in normal position without pressure.



As pipe slides into coupling, ring (b) contracts to allow easy, smooth entry.



As fluid fills coupling and ring cavities, ring (c) expands to give tight seal.

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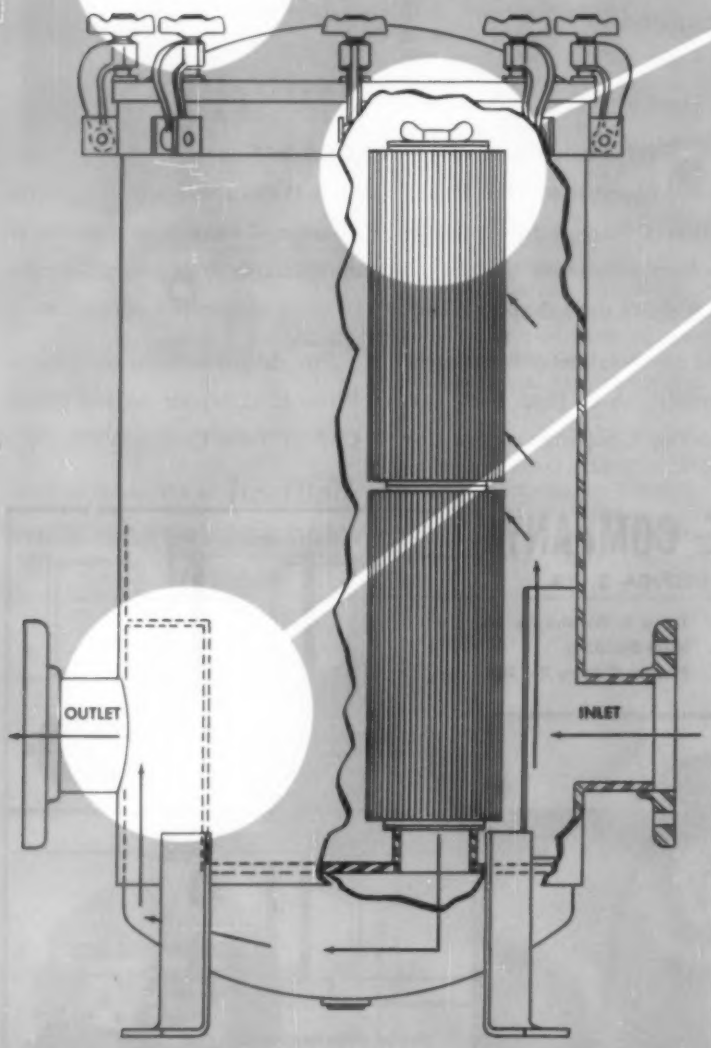

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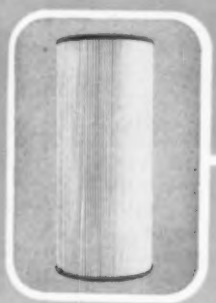

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engineering specifications and details on accuracy and sensitivity. **Write or call: Beckman & Whitley, Inc., 852 East San Carlos Avenue, San Carlos, Calif., for Form F-457.**

•

Grating and Stair Treads are featured in new four-page Bulletin 13a/KL. Available in steel, aluminum, and stainless steel, the products come in both welded and riveted types. Tables list safe loads for the grating and the standard widths and types of steel stair treads most frequently used. Drawings and photos show construction details and uses for the products. **Write or call: Klemp Metal Grating Corp., 6631 South Melvina Avenue, Chicago 38, Ill., for Bulletin 13a/KL.**

•

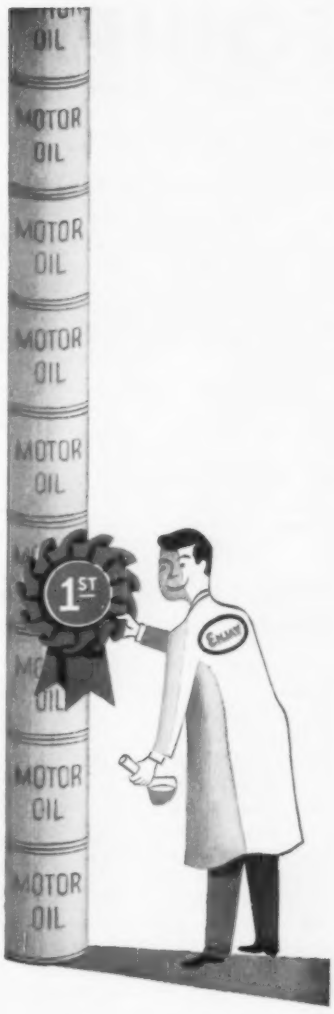
Products and Facilities of Rothschild Boiler & Tank Works are presented in a new 2-color, 12-page brochure. Over 35 illustrations are used to show the variety of products produced and the plant facilities for doing so. These products include elevated tanks and hoppers and large storage tanks erected on location under the supervision of the company's engineers. They also include ducts, pressure vessels, smoke stacks, fabricated pipe, truck tanks, bridge caissons, and barges. **Write or call: Rothschild Boiler & Tank Works, Inc., 1835 Grimmet Drive, Shreveport, La., for brochure of facilities and products.**

•

L-P Gas Control Equipment Catalog. Thirty-page Catalog L-100 covers 2½ and 3-in. screwed globe and angle valves, a new line of flanged globe and angle valves, new additions in relief valves, high and low-pressure regulators, manifolds, check valves, and miscellaneous equipment. **Write or call: Bastian-Blessing Co., 4201 West Peterson Avenue, Chicago 30, Ill., for Catalog L-100.**

•

Pressure-Sensitive Printed Tapes, templates, workboards, and other chart materials are described in the new 1947 Chart-Pak Catalog. Revised and enlarged, it contains 24 pages—4 more than the previous edition—and incorporates a number of new features. Products new with this catalog are listed in red in the table of contents (page 1). They include a new tape-pen—a handy tool designed to facilitate application of 1/32 and 1/16-in. wide curveline tape. **Write or call: Chart-Pak, Inc., Leeds, Mass., for 1957 catalog.**



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EQUIPMENT MEN . . . in the News

J&L Supply Makes Two Store Personnel Changes

T. P. Dellone has been assigned to manage the Farmington, N. M., store and C. W. Campbell has been promoted to be local store manager at Best, Tex., according to announcement by A. G. Bastian, manager, field sales division of Jones & Laughlin Supply Division.

Dellone was formerly manager of the firm's Sherman, Tex., store and Campbell was storeman at Best before his promotion. Dellone started as storeman for J&L at Bolivar, N. Y., in 1940. Campbell started as storeman - advanced at Healdton, Okla., in 1948.

American Iron Holds Special Sales Meeting

American Iron & Machine Works Co. recently held a special sales meeting in Oklahoma City, attended by 40 of its district managers and special representatives, for the presentation of new product information. Shown at the meeting are: W. R. Wheeler, Jr., sales manager, discussing important product-design changes with Claude L. Griffin, vice president and assistant to the president; M. G. McCool, president; and E. E. Rubac, executive vice president.

Gilkison to Manage Gates' Industrial Sales Division

M. T. GILKISON

Appointment of Mark T. Gilkison as manager of the industrial sales division for Gates Rubber Co., Denver, Colo., was announced recently by C. H. Mingle, vice president and director of marketing. Gilkison, who has been assistant manager of the industrial sales division for the past 8 years, fills a vacancy left by L. L. Carroll who is taking sales duties for Gates on the West Coast. In his new position Gilkison will be concerned with sales, both to original-equipment manufacturers and industrial replacement market through distributors.

Gilkison has been with Gates since 1939, having started as sales correspondent. He served for a year as field engineer, later became market-development engineer in the industrial division, and was then promoted to hose sales manager.

Texoma Makes P. R. Soule Sales Vice President

P. R. SOULE, JR.

Paul R. Soule, Jr., has been made vice president in charge of sales for Texoma Supply Co., according to Carl J. Hochenauer, president of the Tulsa firm.

Soule was sales manager for the northern half of the United States for the Chemical Division of John Deere Co. for 5 years, after 7 years in manufacturing and engineering. He previously was eastern sales manager of Wico Electric Co. He served general industry and oil fields on ignition systems for all types of engines.

Crose-Price-O-Matic Double Jointer Is Demonstrated

Discussing a demonstration of the new Crose-Price-O-Matic double-jointer unit, developed jointly by M. J. Crose Manufacturing Co. and H. C. Price Co. are: Robert L. Looney, Tulsa manager, Lincoln Electric Co.; W. M. Irrgang, president, Lincoln Electric; Harold C. Price, president, H. C. Price; D. Michael Curran, president, M. J. Crose; and George Landis, chief engineer, Lincoln Electric.

The Crose-Price-O-Matic consists of portable equipment used to join two lengths of line pipe at a central location along the right-of-way. Lincoln Electric Co. provided the submerged-arc welding equipment used to make both the inside and outside weld.

Fluor Forms Subsidiary In London, England

The Fluor Corp., Ltd., Los Angeles engineering-construction firm, has established a wholly owned subsidiary in London, England, to take advantage of the rapid expansion of petroleum and petrochemical industries in the sterling areas of Free Europe.

James Tathwell, formerly manager of projects at Fluor, will head the new firm, to be called The Fluor Engineering & Construction Co., Ltd. Thomas Harper, formerly sales engineer in the New York office, will serve as sales manager for the new firm.

W. C. Norris' new sucker rod plant located in Tulsa's industrial district.

W. C. Norris Occupies New Plant As Firm Celebrates Diamond Anniversary

W. C. NORRIS, MANUFACTURER, will officially occupy its new and thoroughly modern sucker-rod plant this month, commemorating its diamond anniversary year with another stride in its steady history of progress. The new plant, located in Greater Tulsa's new industrial district, will improve W. C. Norris' ability to serve its sucker-rod customers in oil fields all over the world with faster delivery of an even better product.

W. L. BUTLER

Norris oil field products, including sucker rods, wellhead equipment, bull plugs, swaged nipples, working barrels, polished rods, stuffing boxes, tubing supports, turnbuckles, and other items of equipment are in general use wherever oil is produced.

C. HUFFMAN

Before the new sucker-rod plant was completed the Norris facility included 26 buildings and 192,000 sq. ft. of floor space in a downtown Tulsa location. All of the present plant will continue to operate at full capacity.

The firm was founded by the late W. C. Norris in 1882 in Tiona, Pa., but in 1910, when the oil fields of the Southwest outstripped Pennsylvania pools in production, the shop was moved to Tulsa. At the time of the move the plant was employing about 10 men. At present, employment stands at about 600.

The auxiliary buildings include locker and shower rooms of the latest design, a first-aid room, conference room, foreman's office, compressor room, tool grinding department, and other necessary operating space, such as boiler room, oil storage room, carpenter shop, and paint shop. No item has been omitted which will add to the comfort and morale of the operating force.

G. W. DAVIDSON

The manufacturing equipment in the new plant is the latest and best available. Automation is as complete as is practical to incorporate in the manufacture of sucker rods.

Several innovations have been included, the most spectacular of which is induction heating for forging. This process of heating practically eliminates scale and assures sound, smooth forgings free from pits and irregularities. In this operation the rods are progressed automatically into position at one of the induction heaters where the first end is heated to the proper forging temperature by closely controlled electric power input for a predetermined time cycle. The end is then forged and the rod is conveyed automatically to the next forging machine, where the induction heating and forging cycle are repeated on the other end and rolled out to cool. After cooling, the rods are transported by pallet to the heat-treating operation. The alloy steel rods are fed into one furnace, normalized, automatically conveyed to the second furnace where they are tempered, and delivered automatically to pallets for transportation to the shot-blasting operation.

R. A. COLGIN

C. CROSS

William L. Butler, president of W. C. Norris, has a hard-hitting crew of executives on his first team, including G. W. Davidson, Jr., vice president, sales; R. A. Colgin, vice president, manufacturing; Clint Cross, plant superintendent; A. A. Hardy, chief engineer; and Charles Huffman, treasurer.

A. A. HARDY

In building its new plant, W. C. Norris spared no expense to obtain the finest and most complete sucker rod plant its experience could provide, and to incorporate every operation which could possibly contribute to the quality of Norris products.

EQUIPMENT MEN . . . in the News

Herb J. Hawthorne Absorbs National Oil Tool Co.

Herb J. Hawthorne, Inc., Houston, has acquired National Oil Tool Co., Inc., of Wichita, Kans., as a step in an expansion program. Acquisition of all patents, engineering, and manufacturing facilities, and all sales rights, was announced by R. M. Thornton, Jr., Hawthorne president, following completion of negotiations with Mal Greenberg, National president, and E. A. Natanson, secretary-treasurer of the Wichita firm.

The National cone type of rock bit, which has been used for hard-formation drilling, will be added to Hawthorne's Blue Demon line of bits.

The acquisition includes an 18,000-sq.-ft. plant at Wichita, completely equipped with modern electronic and automatic manufacturing machinery for small-hole bit production. National will keep its manufacturing personnel.

The Wichita plant will be operated as a branch plant of Hawthorne, with all administrative and sales responsibilities to be handled from the Houston headquarters.

E-T Labs Opens Foreign Sales Office in Paris

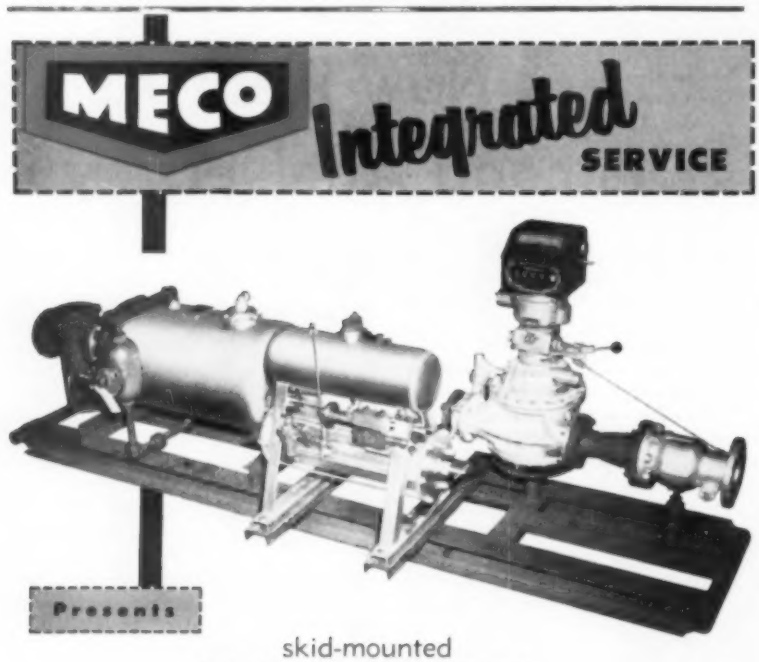
G. FLORIAN

Electro - Technical Labs, a division of Mandrel Industries, Inc., has opened a full-time, permanent, foreign sales and service office staffed by American engineers. To serve the European geophysical industry and to specialize in oil exploration problems, the new office will be located in Paris, France. Headed by Gene Florian, former Mandrel production manager, the office will employ in addition to clerical personnel, two American sales engineers, Les Jasper and George Karamberis who were formerly design engineers at Electro-Technical.

D. D. Mize, general manager of E-T, in making these announcements, said that in the near future other offices will be located throughout the world.

Republic Store Managers Complete Conference

The fifth group of Republic Supply Co. store managers has just completed a special training conference at the general office in Oklahoma City. Attending the conference, top row, were: D. H. Darland, Electra, Tex.; S. E. Long, Rodessa, La.; and C. R. Hines, Odessa, Tex. In the bottom row are: E. E. Copeland, Abilene, Tex.; George Steinmeyer, Oklahoma City, who conducted the course; and Jerry Norwood, Sundown, Tex.



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Los Angeles Nomads Hear "Clipper" Smith

Guest speaker and foreign guests at the September meeting of the Los Angeles Chapter of Nomads are: standing, Ralph C. Charlesworth, Oil Well Engineering Co. from England; B. L. Coker, Mosul Petroleum Co., Iraq; H. V. Hale, Gulf Oil Corp., Mozambique; Simon Stein, Petrobras, Brazil; Francisco de C. Nogueira, Petrobras, Brazil; and Nick Rizzo, S.H.P., Italy. Seated are: Jerome H. Riewer, Baker Oil Tools, Venezuela; Elmer E. Jones, Shell Oil Co., Venezuela; "Clipper" Smith, guest speaker; Frank R. Wilmer, Shell Oil Co., Venezuela; and J. B. Aquino, Formac, Brazil.

HOMCO Acquires Capital Stock of Oil Equipment

Houston Oil Field Material Co., Inc., has purchased all of the capital stock of Oil Equipment, Ltd., a Canadian organization engaged in the oil-well supply business in western Canada.

Oil Equipment was organized in 1947 and from its headquarters in Calgary, Alta., Canada, operates four branch stores, one at Frobisher, Saskatchewan; and at Red Deer, Drayton Valley, and Edmonton, Alta.

It is the intention of HOMCO management to carry on the operation of Oil Equipment in its present form, no organizational changes being contemplated, with the exception of the transfer of C. L. Roach from Rocky Mountain area to be chief executive officer with headquarters in Calgary.

HOMCO facilities for fishing and cutting work, located at Edmonton and Calgary, will be merged with the present organization as quickly as possible in order that the Canadian work may be continued under one management.

GSI Makes Several Changes In Latin American Personnel

Expansion of Latin American operations of Geophysical Service, Inc., has prompted several appointments in supervisory personnel for that area, according to GSI vice president, J. W Thomas.

Thomas, in charge of Latin American operations, has named G. J. Kohler, Jr., as manager of Latin American operations. Reporting to Kohler will be four regional operations managers.

Rodolfo Martin will direct GSI operations in Mexico from Mexico City. John Donna is supervisor for the area. C. J. Spivey will remain in Caracas as manager of Venezuelan operations. P. S. Stoutjesdyk, in Rio de Janeiro, will manage Brazilian operations. H. L. Heggy and P. E. Swensen will be supervisors in Brazil.

GSI's Andean operations will be managed from Lima, Peru, by D. W. Rockwell, with Murrell Holbert as supervisor in Bogota, Colombia.

Rockwell Buys German Engine Manufacturer

Rockwell Manufacturing Co. has acquired ILO-Werke, G.m.b.H., a leading West German manufacturer of air-cooled diesel and gasoline engines, Willard F. Rockwell, Jr., has announced.

Other products made by the firm, in smaller quantities, include flow type and centrifugal transmissions, and shunter and starter sets for industrial engines in cold climates.

The German company has its headquarters and major factory in Pinneburg, near Hamburg, and also operates a plant at Munich. The two provide a total of approximately 215,000 sq. ft. of manufacturing space manned by about 1,200 employes. ILO-Werke management, headed by Heinrich Christiansen as president, will remain the same.

Oilwell's Central Midwest Area Announces Changes

The appointment of Vernon D. Taylor as store manager at Sherman, Tex.; and the promotions of N. Eugene Powell and Billy E. Wright to be field representatives at Greggton, Tex., and Pampa, Tex., respectively, have been announced by William Miskimins, Cen-

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U.S. SAVINGS BONDS
PAY YOU HIGHER INTEREST
FASTER!

If you've always bought U.S. Savings Bonds for their rock-ribbed safety, their guaranteed return, the way they make saving easier—you've got one more reason now!

Every Series E United States Savings Bond you've bought since February 1, 1957 pays you a new, higher interest—3¼% when held to maturity! It reaches maturity *faster*—in only 8 years and 11 months. And redemption values are higher, too, especially in the earlier years.

About your older Bonds? Easy. Just hold onto them. As you know, the rate of interest a Savings Bond pays increases with each year you own it, until maturity. Therefore, the best idea is to *buy the new—and hold the old!*

The main thing about E Bonds, of course, is their complete safety. Principal and interest are fully guaranteed. They are loss-proof, fire-proof, theft-proof—because the Treasury will replace them without charge in case of mishap. Your Savings Bonds are as solid as a rock—backed by the full faith and credit of the United States.

Maybe you already know about Savings Bonds—as one of the 40 million Americans who own them today, or as one of the other millions who have used Bond savings to help pay for new homes, cars, or college educations, or to make retirement financially easier. If so, this is familiar territory to you—you *know* there's no better way to save.

But if you're new to the game, find out about Savings Bonds and what they can do for your future. Ask your banker, or check with your employer about the automatic Payroll Savings Plan that makes saving painless and easy.

PART OF EVERY AMERICAN'S SAVINGS

BELONGS IN U. S. SAVINGS BONDS

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tral Midwest area manager for U. S. Steel's Oil Well Supply Division.

Taylor was employed by Oilwell in 1953 at Gainesville, Tex. In 1955 he was appointed field representative at that location. Powell joined Oilwell at Greggton in 1955. Wright went to work for Oilwell in 1951 at Wichita Falls, Tex. He has been located at Pampa since 1953.

Peake Made Full Partner In S. D. Day Co.

D. W. PEAKE

David W. Peake has been made a full partner of S. D. Day Co., Houston, according to Stephen D. Day. Peake joined the firm in 1950 and spent his first 4 months obtaining practical experience in the field with pipeline crews.

Subsequently he became sales manager responsible for all marketing operations including advertising, promotion, and public relations. S. D. Day Co., organized in 1949, is a manufacurer's representative in pipeline coating and allied products for Ruberoid Co. nationally; Pittsburgh Coke & Chemical Co. in Texas, New Mexico, Louisiana, and Mississippi; and American Coating & Supply Co.'s Field-jointer line in the South.

Franks Completes Last Unit at Tulsa Location

This Comet drilling rig, to be delivered to Carl Martin Well Servicing Co., at Houston, is the last unit to be produced in the Tulsa plant of Franks Division, Cabot Shops, Inc., before Franks completes its move to Pampa, Tex.

Making final inspection as a welder puts on finishing touches are C. C. Simmons of Franks; Vern Alley, Franks district manager at Houston; and Carl Martin, rig owner. The first Franks unit was produced in the Tulsa plant in 1931. The changeover from Tulsa to the Pampa plant has been made gradually and the first unit from the Pampa plant will be completed in a few days. Franks will maintain a district sales office at Tulsa.

Fruehauf Names Biggers to Head Hobbs Trailers

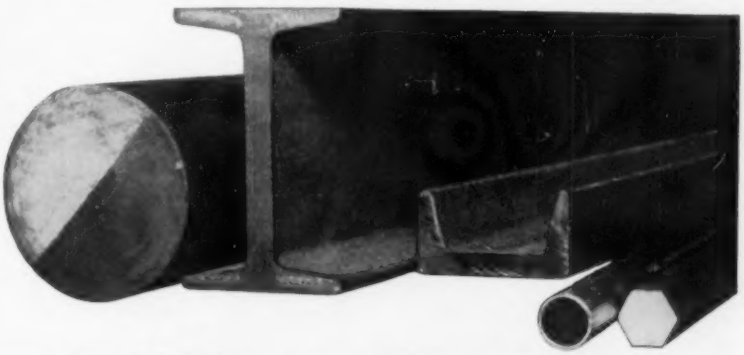
The election of R. N. Biggers as vice president and general manager of Hobbs Trailers Division, Fruehauf Trailer Co., has been announced by Roy Fruehauf, president of Fruehauf Co.

Biggers, who will be headquartered in Fort Worth, succeeds William E. Grace, who was recently elected executive vice president of Fruehauf. Biggers has been with Hobbs since 1939. He started as secretary to Grace. He became assistant sales manager in 1940; Lubbock, Tex., branch manager in 1949; and vice president in charge of sales in 1953. He was made general sales manager in 1955.

L. A. Grossman Joins Brown-Strauss Corp.

Louis A. Grossman has joined the executive staff of Brown-Strauss Corp., according to a recent announcement. He will be actively engaged in management, and in buying and selling pipe, structural steel, and related products.

Grossman has had over 30 years of



OIL AND GAS MEN TELL US...

3 major reasons keep them coming back to Ryerson:

Flame-cut steel shapes save you money—one piece or hundreds—almost die-cut accuracy.

1. Biggest stocks—nobody comes even close to the size and variety of Ryerson inventories.
2. Unequalled processing facilities—assuring fast, accurate service on any requirement.
3. Dependable, certified quality—at fair prices—whether steel is plentiful or scarce.

RYERSON STEEL

PRINCIPAL PRODUCTS IN STOCK

CARBON STEEL—bars • structurals • plates sheets • tubing, etc.

STAINLESS—Allegheny Metal pipe • tubing • sheets plates • bars, etc.

ALLOY STEEL—including case hardening, direct hardening, heat treated and Rycut free-machining leaded alloys.

OTHER PRODUCTS—safety plate • grating • expanded metal • chain • wire rope • reinforcing bars plastic sheets • pipe & tubing • machinery & tools.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

experience in merchandising pipe and steel and his activities have included the entire United States.

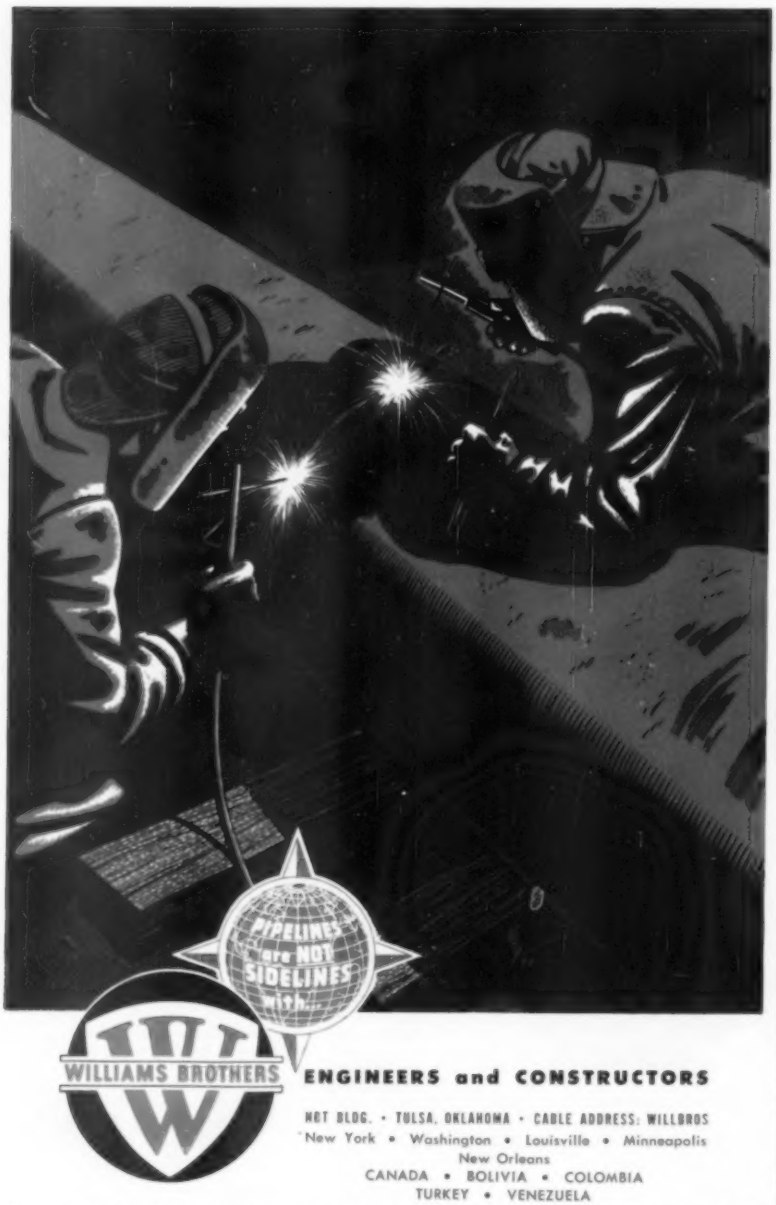
Honeywell Expands Scope of Systems Engineering Sales

Realignment of sales activities to keep pace with expansion of its systems engineering group was announced recently by the Industrial Division, Minneapolis-Honeywell Regulator Co.

Two sales divisions, eastern and western, have been set up, with J. T. Teed in charge of the former in Philadelphia and T. W. Tracy heading the latter in Los Angeles.

The move was dictated, J. A. Robinson, field manager, said, by the increasing growth of systems engineering in processing industries, and data handling.

Teed joined Honeywell as an industrial salesman in Tulsa in 1951. He had been manager of the Tulsa branch office since 1954. Tracy joined Honeywell in 1949 as an industrial salesman. At the time of this appointment he was a member of Honeywell's rocket and missile team on the West Coast.



WILLIAMS BROTHERS

ENGINEERS and CONSTRUCTORS

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New York • Washington • Louisville • Minneapolis

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CANADA • BOLIVIA • COLOMBIA

TURKEY • VENEZUELA

OIL • GAS • WATER • PRODUCTS PIPELINES • PUMPING STATIONS

Allen Made Sales Manager, Chicago Steel Tank Co.

R. L. ALLEN

Robert L. Allen has been appointed general sales manager of Chicago Steel Tank Co., a division of U. S. Industries, Inc., according to D. D. Cleghorn, general manager of Chicago Steel Tank Co. Allen was previously associated with Fritz W. Glitsch & Sons, Inc., Houston, as district sales manager from 1949 till 1955, and then as general sales manager until the present change.

Johnston Pump Opens New Warehouse in Hastings

Johnston Pump Co., Pasadena, Calif., a division of Youngstown Sheet & Tube Co., has opened a new warehouse and assembly center in Hastings, Neb. Bob Triplett, formerly district representative at Kansas City, Mo., will be in charge.

The new building will serve as headquarters for the distribution and servicing of the company's complete line of deep-well vertical pumps in the Nebraska, Kansas, and Colorado area.

Vaupel Is Named Vice President of Aldrich Pump

C. H. VAUPEL

Appointment of Carl H. Vaupel as vice president and general manager of Aldrich Pump Co., Allentown, Pa., manufacturer of pumps and hydraulic equipment for the petroleum and chemical-processing industries, has been announced. He succeeds G. Donald Ruhe who has retired.

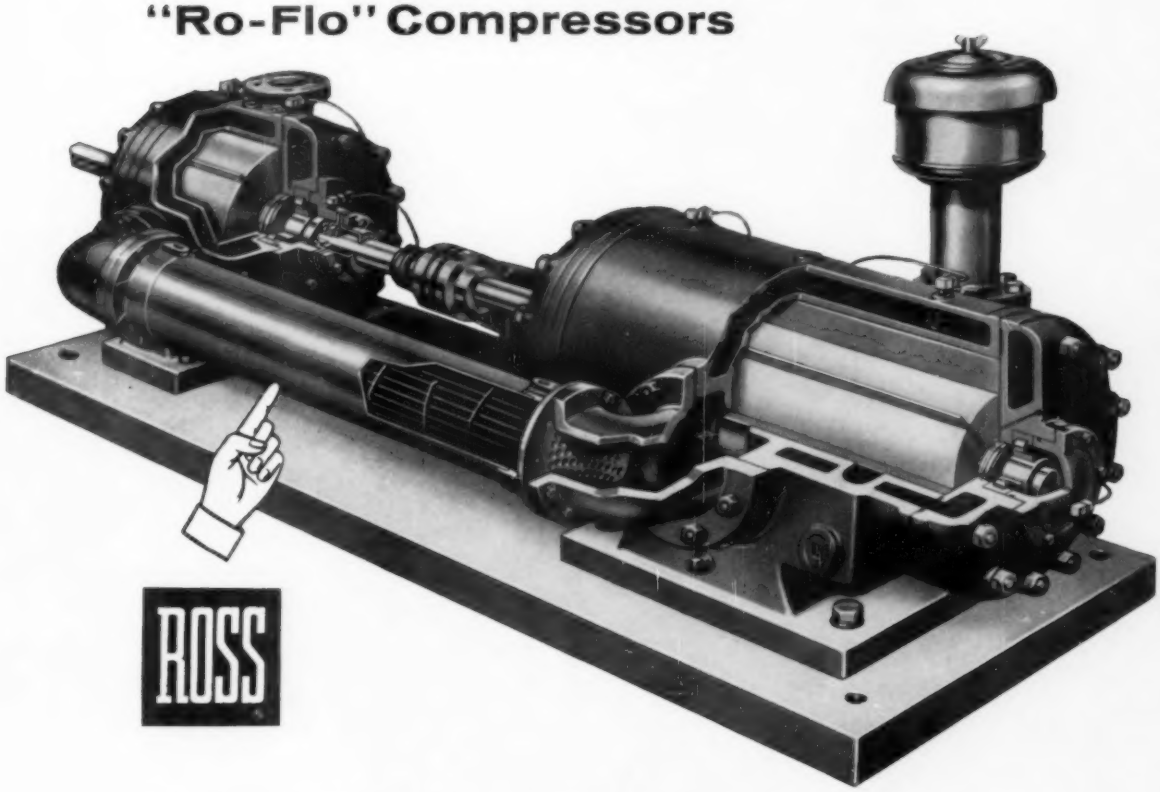
Formerly resident manager of Cooper-Bessemer Corp. in Grove City, Pa., Vaupel had previously served as assistant to the president of that corporation. His earlier affiliation included Fairbanks, Morse & Co., Northern Pump Co., and Aircraft & Diesel Equipment Corp.

B & W, Inc. Shifts Hill to Houma, La.

The transfer of Claude Hill from its Wichita Falls, Tex., territory to Houma, La., has been announced by B & W, Inc. Hill's long field experi-

ROSS INTERCOOLERS

boost thru-put capacity of "Ro-Flo" Compressors



With volumes ranging from 250 to 1800 cfm and pressures from 60 to 125 psig, smooth running two-stage "Ro-Flo" compressors manufactured by Allis-Chalmers (like the one shown) are used for shop air, gas handling and drilling applications.

To insure peak performance, a Ross Intercooler is furnished as an integral component between the low and high pressure stages. First stage compression heat is removed from the air or gas, along with condensed moisture, before it enters the second stage cylinder. The result: Increased thru-put capacity and lower discharge temperatures.

Rated first for their heat transfer efficiency and ruggedness, Ross Cylinder-Mounted Intercoolers are widely preferred by compressor builders and users alike. The same holds true for Ross Aftercoolers, Lube Oil Coolers and Jacket Water Coolers. Available in a wide range of standardized designs, they are used to meet practically every compressor cooling requirement.

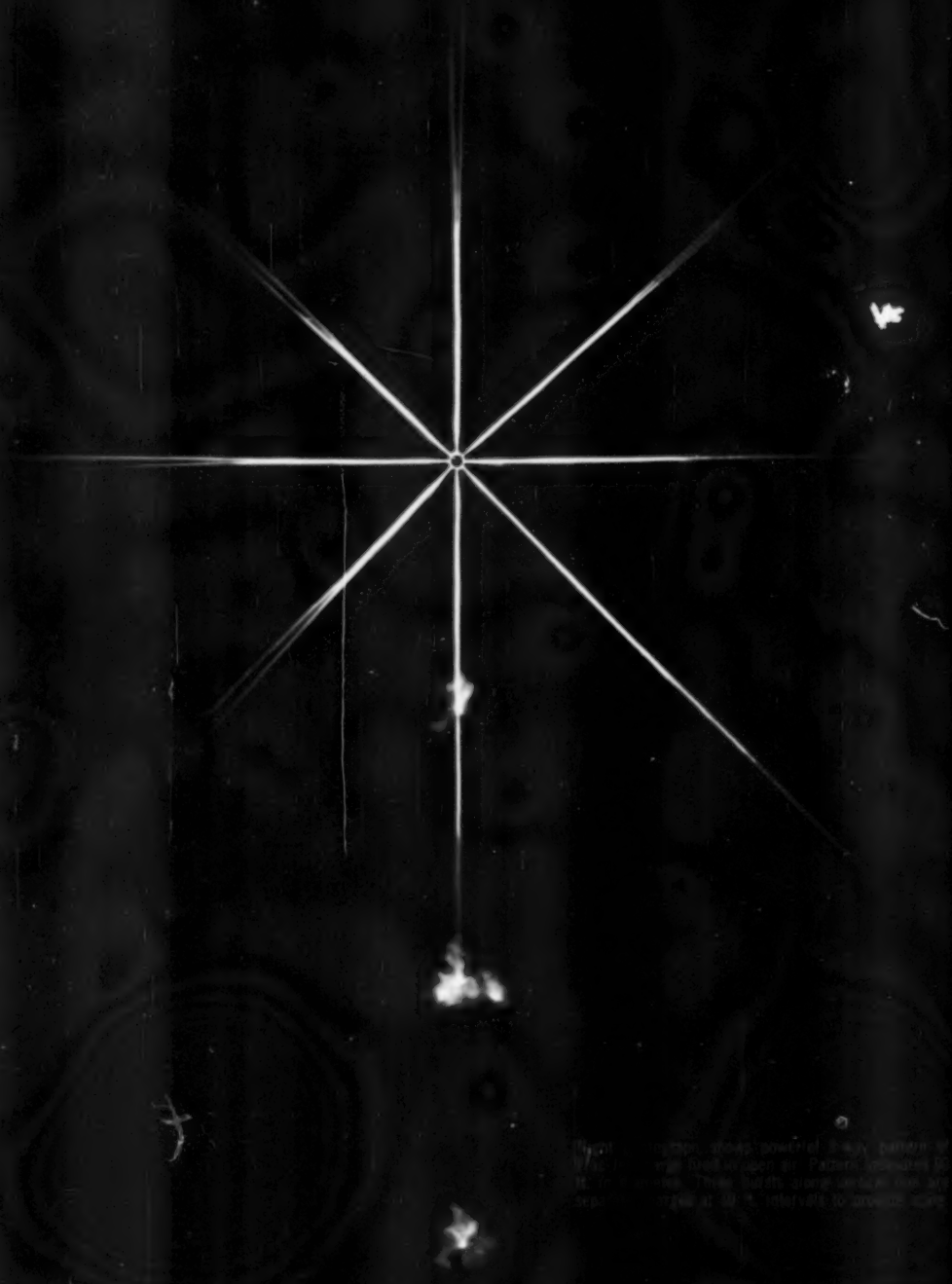
For further information on the many types of compressors served by Ross Exchangers, write Ross Heat Exchanger Division of American-Standard, Buffalo 5, N.Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

INTERCOOLERS
AFTERCOOLERS
LUBE OIL COOLERS
JACKET WATER COOLERS

ROSS HEAT EXCHANGER

Division of AMERICAN - Standard

Another Jet Research Center
development of the
powerful BARRIER charge



8-way barrier jet

cracks deep horizontal fractures

FRAC-JET*

WITH THIS NEW Frac-Jet you can place fractures *where you want them* and start deep horizontal fissures which conventional hydraulic fracturing can extend and widen. Eight high-velocity barrier jet charges at 45° phasing on the same plane are sealed in an aluminum alloy case. This pattern fires simultaneously.

The Frac-Jet is the newest development of Jet Research Center's continuing program to bring the oil industry new and more powerful perforating processes and equipment. Working in close cooperation with Stanford Research Institute and a major oil company, Jet Research Center has established the effectiveness of Frac-Jet during more than three years of laboratory and field testing.

Ask your Jet Process licensed service company for full information . . . or write to Jet Research Center, world headquarters for jet research and development.

*TM REG. PENDING

Diagram of Frac-Jet construction. Note barriers at base of each charge. Special aluminum alloy case resists highest well pressures yet shatters into small uniform fragments upon detonation.

JET RESEARCH CENTER, INC.

P. O. Box 246, Arlington, Texas • Telephone CR 5-2864

GREATER PERFORATING POWER THROUGH RESEARCH

ECONOMICAL FROM EVERY ANGLE

'AMERICAN' "Every Angle" THERMOMETERS

No longer is it necessary to fuss and figure what angles of stem connection are required in thermometers for each location. These American "Every Angle" Dial Thermometers can be set at any angle within 180° on *two* axes – set at the best angle for easiest reading.

Regardless of what piping arrangements are engineered into your processes – no matter how many times they are revised – the list of American "Every Angle" Thermometers in your original specifications need not be changed. Equally important, your thermometer inventory in all required temperature ranges and stem lengths will be far smaller. That's real economy – from every angle.

Bi-metal . . . mercury . . . vapor pressure – all three types of actuation are available in American "Every Angle" Dial Thermometers. They are precision instruments that assure accuracy within 1% of scale range. Their high accuracy is sustained throughout service life, whether installed indoors or outdoors.

Make full use of these highly sensitive thermometers at all important check points in your plant. You will maintain product quality far better than ever before. Your field operators will be able to take readings more easily, more accurately, more frequently – will save time-stealing trips to the control house. Convince yourself of the all-around economy of American "Every Angle" Dial Thermometers. Write for complete information.

BI-METAL ACTUATED, TYPE 6060AH. 5" Anti-Parallax Maxivision Dial. **Temperature Ranges:** –80/120 F. to +200/1000° F. **Stem Lengths:** 4" to 24". Climate-proof stainless steel case.

MERCURY ACTUATED, TYPE 6042RM. 4½" Anti-Parallax Maxivision Dial. **Temperature Ranges:** –20/120° F. to 200/1000° F. **Stem Lengths:** 4" to 24". Climate-proof glass and stainless steel case.

VAPOR PRESSURE ACTUATED, TYPE 6040TW. 3½" Dial. **Temperature Ranges:** –20/120° F. to 260/450° F. **Stem Lengths:** 3" to 24". Models for indoor or outdoor service.

Separable sockets can be supplied in all materials and sizes normally required.

SET-ABILITY THAT MEANS FLEXIBILITY IN APPLICATION

SET IT for use as a side angle, 90°, oblique or top connection thermometer.

SET IT for use as a straight-form thermometer.

SET IT for use as an oblique-form thermometer.

SET IT for use as a standard 90° back-connected thermometer.

CALL ON YOUR INDUSTRIAL SUPPLY DISTRIBUTOR for experienced counsel in dial thermometer selection. You can depend on him for prompt delivery from local stocks.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

AMERICAN INDUSTRIAL INSTRUMENTS

A product of **MANNING, MAXWELL & MOORE, INC.** STRATFORD, CONN.

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* 'CONSOLIDATED' SAFETY RELIEF VALVES, *Tulsa, Okla.* AIRCRAFT CONTROL PRODUCTS, *Danbury, Conn., and Inglewood, Calif.* "SHAW-BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

ence is well adapted to the more difficult cementing problems of offshore and deep wells in southern Louisiana.

He will work closely with operators in the selection and application of B & W scratchers, centralizers, and related well-cementing equipment.

McCullough Makes Schaller Division Sales Manager

H. E. SCHALLER

Herman E. Schaller has been made Pacific division sales manager for McCullough Tool Co., with headquarters in Los Angeles, according to I. J. McCullough, president. Schaller has been with McCullough for 8 years as sales representative, and, more recently, as Pacific Division logging manager. Before joining McCullough he had had extensive engineering experience in the oil industry and as a consultant to the U. S. Navy.

Barnett Made Testing Engineer by BrakeSol

Larry D. Barnett has been appointed as treating engineer for Canada for BrakeSol, Inc., Oklahoma City, according to Lester P. Brake, president.

Barnett will make his headquarters in Edmonton, Alta. He will consult on and set up paraffin-treating programs especially designed for Canadian fields.

Dallas-Fort Worth Nomads Hear Dresser Executive

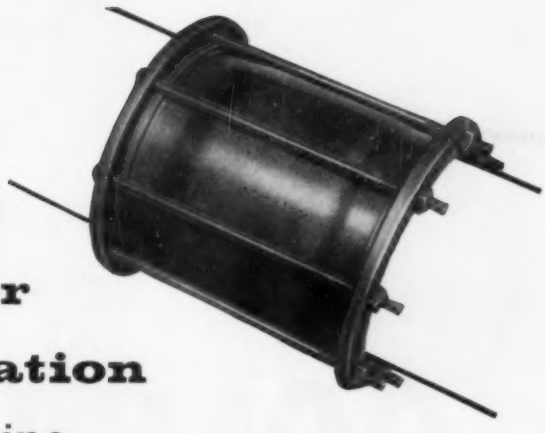
The Dallas-Fort Worth Chapter of Nomads heard a report, "The Long Range Outlook For The Oil Industry," made by Fred Carlson, director of business research, Dresser Industries, Inc., at its September meeting held at the Dallas Athletic Club.

G. Herschel Lewis, chapter president, announced that the regular business meeting wou'd be held in December and that installation of officers will take place in January.

Texoma Is Made Selling Agent for Diesel Energy

Diesel Energy Corp. of New York City, the factory branch of Kloeckner-Humboldt-Deutz A.G., has announced the appointment of Texoma Supply Co., Tulsa, as exclusive selling agency to the American petroleum industry for the complete line of Deutz engines.

Kloeckner-Humboldt-Deutz, Cologne,



for faster installation join pipe

THE DRESSER WAY!

You'll find plenty of uses for Dresser Couplings and Long Sleeves around a drilling rig . . . or anywhere else you join pipe.

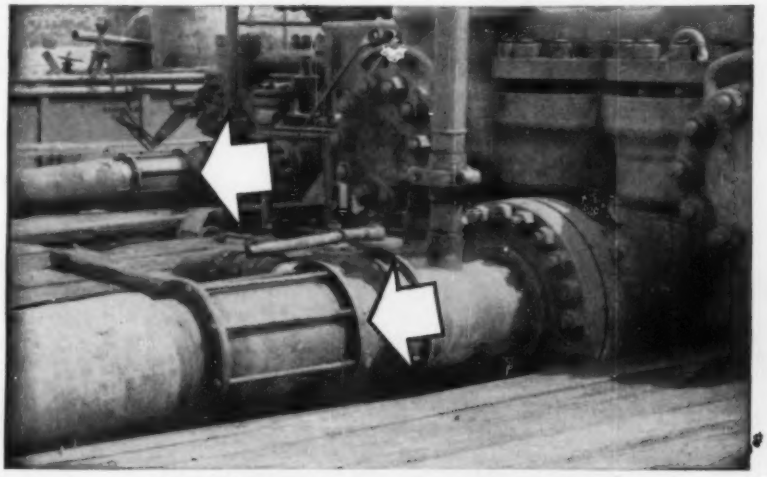
That's because Dresser Long Sleeves make pipe joining so quick and easy. Pipe threading is eliminated. You simply slip on the sleeve and tighten with a wrench. Perfect alignment of pipe sections is unnecessary because the specially compounded rubber gasket permits up to 4° deflection at joints.

You get a permanent, bottle-tight connection every time—one that has the "give and take" necessary to absorb vibration, settlement and other stresses.

DRESSER®

Dresser Manufacturing Division • Bradford, Pa.

ONE OF THE DRESSER INDUSTRIES



AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES IN THE UNITED STATES AND CANADA

Style 38 Coupling

Style 40 Long Sleeve

Hydrepair® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

FOR COMPLETE DRILLING HARMONY

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Drayton Valley
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Andrews
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Corpus Christi
El Campo
Falfurrias
Freer
Graham
Hadacol Corners
Houston
Kermit
Kilgore
Longview
McAllen
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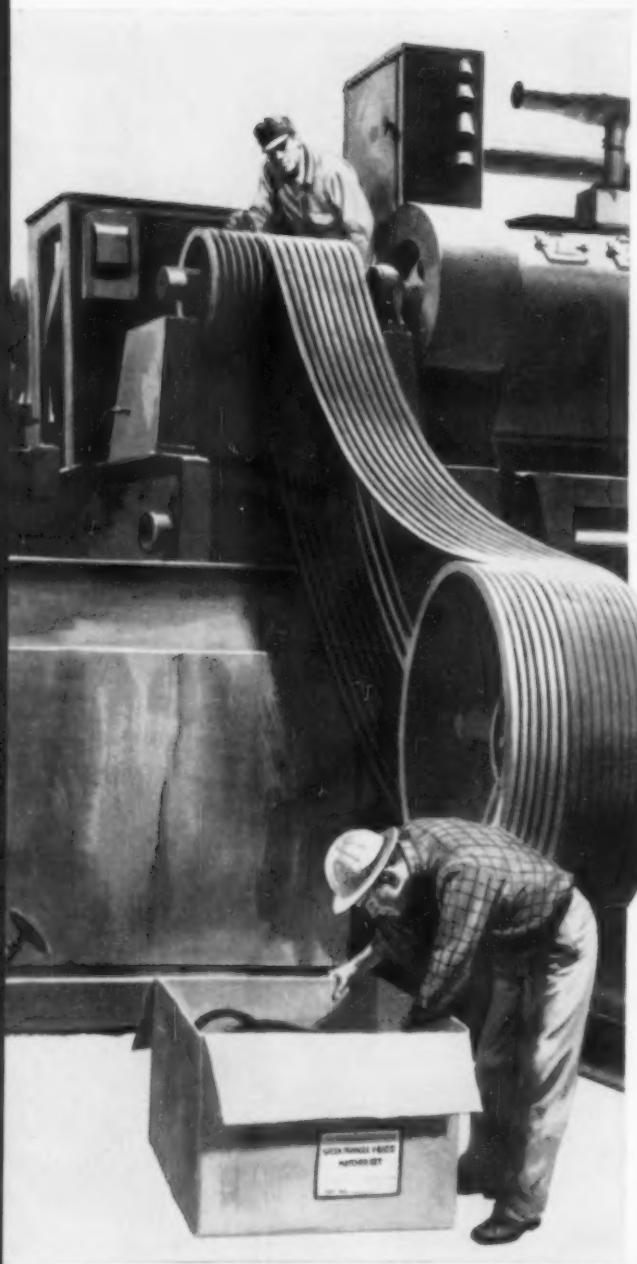


SPECIAL

. . for oil field use

GREEN TRIANGLE V-BELTS

Why gamble on "general purpose" V-belts when GREEN TRIANGLE V-belts . . . designed exclusively to meet rugged oil country use . . . are available from your Continental-Emsco stores?

Here are belts in matched sets, engineered for continuous operation . . . belts that will withstand the heat and abrasive sands of Saudi Arabia, the salt sprays of the Gulf and the deep freeze of Canada.

Increase V-belt life with a call to your Continental-Emsco man and ask for *oil field tough* GREEN TRIANGLE V-belts . . . manufactured by the New York Belting and Packing Company and distributed throughout the world's oil fields by Continental-Emsco.

. . Equipment

THESE QUALITY ITEMS REDUC

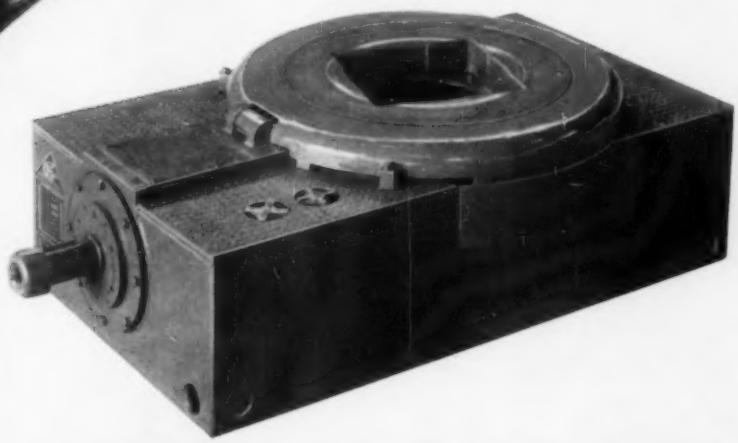
Today's drilling demands modern design

CONTINENTAL-EMSCO

Swivels and Rotary Tables

C-E swivels and rotary tables are heavy-duty accessories that work hand-in-hand for faster, high-pressure drilling. They are designed to handle all the demands created by modern drilling . . . longer, heavier drill pipe strings . . . higher mud circulating pressures . . . more drill collars . . . faster trips.

You can depend on C-E swivels and rotary tables to work harder, last longer and require less maintenance. Let your Continental-Emsco man show you how these accessories can help you make more hole . . . and more profit.



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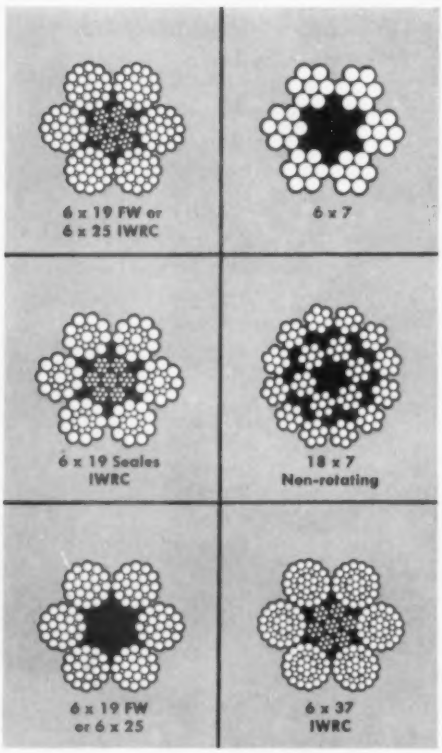
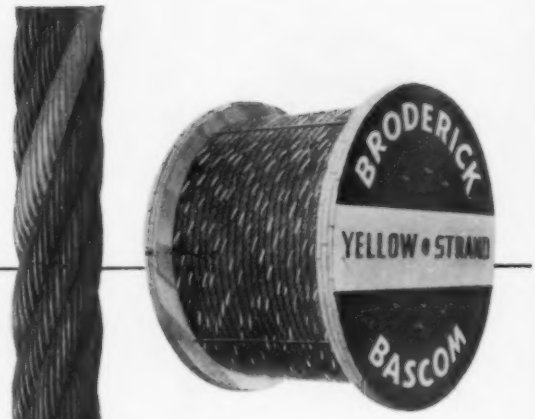
JCE DRILLING DOWNTIME

Standardize on

Yellow Strand®

"POWERSTEEL"





If you need a wire line *today* . . . *tomorrow's* too late. That's why it pays to standardize on Yellow Strand . . . the oil country's most dependable wire rope that's *in stock every day* at your nearby Continental-Emsco store.

Store stocks are backed up by Broderick & Bascom warehouses at Peoria, Houston, New Orleans, St. Louis, Seattle and Los Angeles. You can be assured that the size, construction and grade of rope you standardize on will be ready for immediate delivery at all times.

Discuss wire rope with our store people and select the grade and size that will give the longest wire line life possible for your money.

for Service

SUPPLIES AND SERVICE

CONTINENTAL-EMSCO

Drilling Masts

the preferred mast for land or marine rigs

Portability and *ruggedness* . . . the features most preferred by contractors and drillers . . . have been designed and built into the new Continental-Emsco B-Series masts. In addition, the open face mast design provides greater block clearance for faster, safer block travel, and unimpaired visibility.

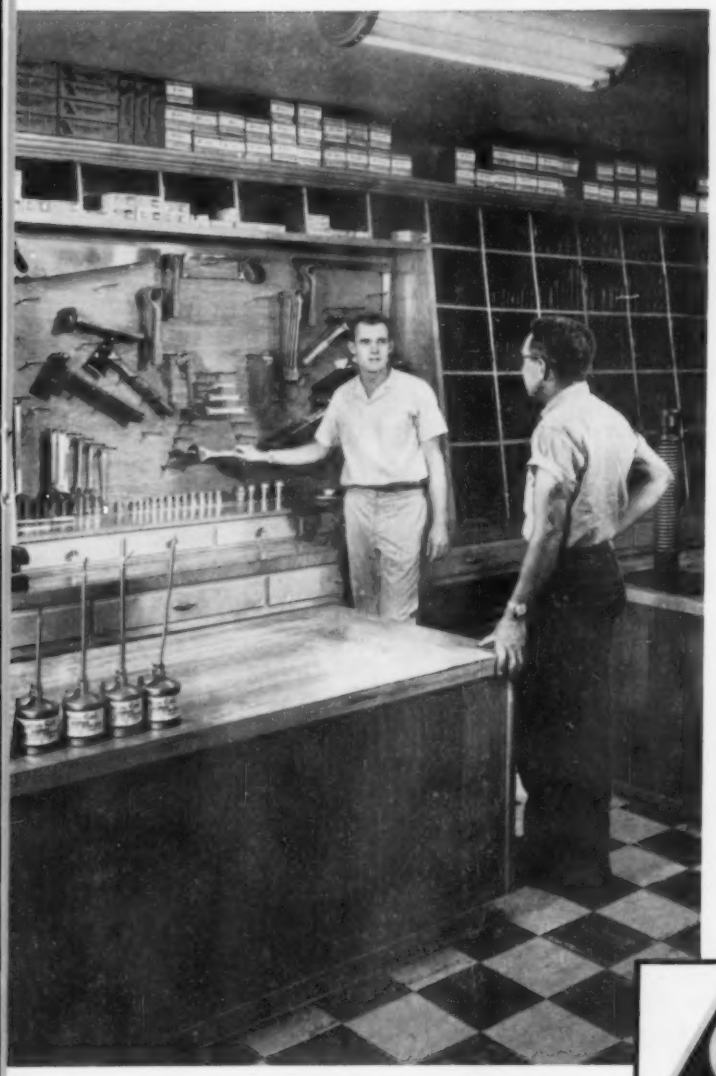
Faster erection is now possible with these *field proven* features: (1) rear leg pivot and ground level assembly; (2) simplified pin connections for all mast sections; and (3) positive line control during raising and lowering, eliminating the need for snubbing lines.

Positive line control also makes these masts ideally suited for barge installations, since they can be quickly lowered . . . *without snubbing lines* . . . when approaching over-water obstacles . . . or when severe weather sets in.

Discuss your drilling mast requirements with your Continental-Emsco man.

that Sings..

CE THROUGHOUT THE DRILLING WORLD



"Jim . . pick out the kind and size you want"

This tool pusher knows that at Continental-Emsco he'll find a wide selection of sizes, types and designs of everything he needs. This wide variety of products saves his time by making *one-stop buying* possible. And he also knows he'll receive prompt, *personalized service* from our store people and continuous follow up and checking of factory shipments.

Don't neglect the advantages of *. . in person buying . .* at your nearby Continental-Emsco store.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company
General Offices: Dallas, Texas • Export Division: 45 Rockefeller Plaza, New York, N. Y.
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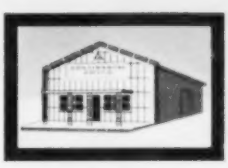
Continental-Emsco Company C.A., Caracas, Venezuela • Plants: Los Angeles • Houston • Garland, Texas • *Representatives in All Principal Oil Fields of the World*

..Go CONTINENTAL-EMSCO



V732

West Germany, was established in 1864 and has continuously manufactured internal-combustion engines. The line now includes both water-cooled and air-cooled models.

H. A. Riley, Jr. Named to Key Post by Southwestern

Appointment of Harry A. Riley, Jr., to the position of sales manager of the wholesale division of Southwestern Plastic Pipe Co., Mineral Wells, Tex., has been announced by E. W. Hendrick, manager of the firm.

Riley has been a sales representative in charge of sales-development work since joining the company early this year. In his new post he will be responsible for supervision of plastic pipe sales to distributors served by the company.

Continental-Emsco Moves To Larger Dallas Quarters

Continental-Emsco Co. has announced plans to relocate its home office in Dallas into larger quarters. The move, slated for late 1958 will headquarter the supply and manufacturing firm in the Mercantile Commerce Building. Continental-Emsco is a division of Youngstown Sheet & Tube Co.

Continental-Emsco will have an office area of 60,000 sq. ft., occupying three floors of the enlarged building. District offices of Youngstown Sheet & Tube also will be in the new building.

Adlam Co. Named Rolatape Representative in Canada

Rolatape, Inc., manufacturers of Rolatape measuring wheels, has announced the appointment of Adlam Tool & Supply Co., Ltd., of Montreal, as Rolatape's direct factory representative for eastern Canada.

The Adlam company will administer Rolatape's authorized factory dealer sales program, according to P. W. King, Rolatape president. Adlam Tool & Supply is headed by Stanley Adlam.

Failing's Casper Store Moves to Larger Quarters

The Casper, Wyo. store of George Failing Co., has been moved to this new and larger building. E. E. Martin is district manager in the Rocky Mountain area and the store manager at Casper is Oliver Kucera. Failing, an Enid, Okla. firm, manufactures portable rotary rigs.

Johnston Tester Shifts Rippetoe to Fort Worth

The assignment of Fred Rippetoe to Fort Worth as salesman covering the Fort Worth-Dallas area for Johnston Testers, Inc., has been announced by Phil Griffin, Johnston sales manager.

Rippetoe joined Johnston in 1950 as a tester and after only 2 years he was named district manager at San Angelo, Tex. He was shifted to the sales department in Abilene, Tex., in 1955, covering the North Texas area.

Donnelly Joins Plastic Applicators in Houston

P. R. Donnelly has been named sales representative, Houston area, by Plastic Applicators. Donnelly was formerly with Petreco and Tretolite divisions of Petrolite Corp. where his experience included work on corrosion problems in West Texas, South Louisiana, and Texas Gulf Coast. He will act as sales and service representative for tubular goods inspection services and baked-on plastic coatings.

Varec Expands Electronics Division, Changes Name

Vapor Recovery Systems, Inc., of Compton, Calif., has doubled the size and facilities of its electronics division and renamed it the electro-mechanical division.

The name change and enlargement are part of a planned expansion of the firm's entire operation, according to Frank V. Long, Sr. The new division will be under the supervision of H. Dickinson, chief engineer. Dickinson was also in charge of the electronics division.

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Many of our well treatment services and products have stemmed from the continuous search by Dowell field personnel for a *better* way of doing your job.

Laboratory research is important—that's why we maintain some of the best equipped, best staffed laboratories in the oil industry. But that alone is not enough. To provide you with new and improved services and products, Dowell will continue to combine ideas from our chemical, physical and mechanical labs *and* from the man in the field. Dowell Incorporated, Tulsa 1, Oklahoma.

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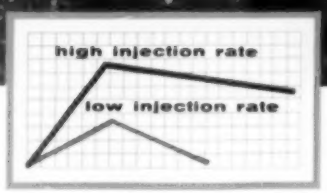

High injection rates have shown greater production and slower decline.

In most things, gentleness is good and proper.

But not so with some oil and gas reservoirs. To make them *give*, often calls for a "get tough" policy.

Dowell knows how to get tough with tight sands, and has the equipment needed to do it. Exclusive with Dowell is the new high-injection-rate "Frac Team": 1) the mighty Allison Pumper with power to spare, 2) the Remote Panel for safer operation, and 3) the Dowell Blender for precise control of sand and fluid mixing.

More and more, operators are finding that the harder you hit some formations with frac fluid, the greater the production is increased. Two to ten barrel-per-minute rates often provide little more than temporary stimulation. On the other hand, thirty to fifty bpm injection rates into the same formation often establish high and lasting production potentials. Also, with high injection rates, there is less danger of sand screen-outs.

Got a tight sand problem? Dowell will get after it with the experience and equipment they pioneered in high-injection-rate fracturing. Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

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Alberta Foothills Trend Pushes Farther North

By Frank J. Gardner
Exploration Editor

THE CHAIN of gas discoveries in Alberta's foothills region has now been firmly anchored at the Athabasca River, by a one-two-three series of strikes at Stolberg, Lovett River, and Lambert Creek.

A RATHER amazing sequence of important gas strikes has swept across Alberta's western foothills belt recently. Six major discoveries in less than a year have focused industry attention on this 360-mile trend; of the six, four have been made by a single operating group; and of these four, two have opened production from formations that had never produced here before.

New pay zones . . . Nearly all the gas fields shown on today's map have found their flows in rocks of Mississippian (chiefly Rundle) age. But in October 1956, British American Oil Co., Ltd., et al, announced the discovery of Triassic gas in its Mountain Park 5-36 well to establish the first Triassic production in the foothills area. This year, B.A. et al. have forged ahead to find success at Stolberg and at Lovett River (both Mississippian hits), and at the northern end of the trend, these operators capped their run of luck with a new discovery at Lambert Creek, the first Devonian strike in the trend. The other two foothills finds of the past year were made by Shell Oil Co. at Waterton Parks and Texaco Exploration Co. at Castle River near the southern end of the belt (OGJ, Aug. 19, 1957, p. 289).

And four new fields . . . The B.A. quartet of hits has emphasized the enormity of this Canadian gas target. And this enviable record in a region of extremely complex geology is a tribute to Canadian discovery thinking. Sharing the glow of success with B.A. are its partners, Triad Oil Co., Ltd.; Royalite Oil Co., Ltd.; and Sun Oil Co.

In 1956, the Mountain Park discovery flowed 6,160 M.c.f. of gas per day from the Triassic at 10,219 ft. This was the first of the four strikes now culminating at Lovett River, Lambert Creek, and Stolberg. The last three have all burst upon the scene in the past month.

At Lovett River, Well 12-30 flowed Mississippian gas at the rate of 5 M.M.c.f.d. from perforations at the 11,600-ft. level; observers estimated a gross pay interval of 130 ft. or more in the well.

At Stolberg, 36 miles southeast of Lovett River, Well 6-10A made news last June when it flowed Rundle gas at a rate of 8,500 M.c.f. daily at 11,425 ft. But that was only the first of three Rundle zones it was to uncover; a second zone at 13,004 ft., flowed 8 to 10 million feet; and just this week, operators announced a third pay at 13,457 ft. had flowed 3½ million per day.

At Lambert Creek, the real news was the revelation that commercial gas from the Devonian D-1 had been found. Here, Well 6-4 flowed 10,600 M.c.f. daily on a drill-stem test below 12,800 ft. This one lies 30 miles northwest of Lovett River and 65 miles northwest of Stolberg. If finally finished in the Devonian, the entire foothills will have gained another target for the future.

Open a vast new province . . . These fast-occurring developments have thrown open a vast new producing province for later exploitation. The arrow on the map is indicative; we can look for the trend to grow north and west from this point on. It has now reached the Athabasca River, and it can be expected to expand as far as the British Columbia border, linking up with older discoveries in the Cutbank, Campbell Creek, and Chinook regions of western Alberta. Coupled with the impressive Castle River, Waterton Park, and Pincher Creek developments at the south end of the foothills belt, the recent events on the B.A. group's 1,300,000-acre block portend an active future campaign from border to border in Alberta.

Getting ready for an international audience . . .

General Chairman of the Society of Exploration Geophysicists F. J. Agnich (right) and John Wilson, publications chairman. Agnich is president of Geophysical Service, Inc., Dallas, and Wilson is marketing administrator for the same company.

John Wilson and F. J. Agnich check the program as

Global Exploration, and New Techniques Are Slated for S.E.G.

Dallas, November 11-14

By Norman S. Morrisey
Drilling Development Editor

WHAT is the relation between oil finding and geopolitics? Have we improved our oil-finding techniques? Where is seismic work paying off in world-wide exploration? These are only a few questions that the Society of Exploration Geophysicists hope to have answered at the National Convention scheduled for November 11-14 at the Statler Hilton Hotel, Dallas.

Instruments . . . Oil exploration is not a static science, the scene is constanly changing. And probably the greatest strides have been taken in instrumentation and field techniques. As one top geophysicist put it, "Comparing today's instruments and their performance with those in use in 1940, is like comparing a 1958 automobile with its 1940 ancestor."

Transistors that have proved so successful in the electronic and communication fields are invading the field of geophysics. The transistor is particularly useful since it effects a great saving in many instances in both space and efficiency. Transistorized power converters are available that will replace dynamometers and vibrator power supplies. And there is a distinct trend in instrumentation toward simplified equipment for plotting seismic record sections.

The continuous velocity logger has proved to be a useful exploration tool and more oil companies are using the logger. There are now several companies that provide this service to industry.

Chemical logging of the drilling mud to detect shows of oil and gas is replacing the conventional method using the hot wire to spot shows. Mass spectrometers, infrared analyzers, and gas chromatographic columns have all been applied successfully to this technique of continuously analyzing the drilling fluid. The infrared technique looks particularly promising.

Geophysics and geopolitics . . . Are we allowing our oil-finding talent to wither on the vine? Can nonoil countries afford to save their oil prospects for some future exploration cycle? Paul Lyons, past president of the Society of Exploration Geophysicists, and Ben F. Rummerfield, incoming vice president of the S.E.G., point out that our oil-finding talent is a highly perishable commodity. This vast pool of technical ability and equipment is now available to the world. But, they emphasize, proper incentive is needed to preserve this storehouse of talent. And they emphasize the day is past when a country can withhold oil prospects for the future because of the threat to oil from other sources of energy, such as solar or atomic.

The authors point out that private enterprise in a proper political and economic climate enjoys a tremendous advantage over government-controlled exploration. They conclude that the edge is 10 to 1 in favor of private enterprise based on the results of world-wide exploration.

African exploration . . . During the past 5 years the French Government and interested oil companies have exerted a tremendous exploration effort in French Africa. Extensive reconnaissance work and later detailed mapping has uncovered some very interesting discoveries. Geophysics has played a major role in the French African exploration program. All geophysical techniques have been applied—gravity, magnetic, seismograph, and electrical methods. Close cooperation between the geophysicist and geologist has been a major factor in finding these significant prospects.

Two very informative papers will cover African exploration at the convention. M. Piechot and H. Richard with Compagnie Generale de Geophysique, Paris, will discuss some technical aspects of seismic prospecting in the Sahara. They indicate that early exploration results were unsatisfactory and the cost of seimic surveys exceedingly high. Better field methods and instrumentation since 1953, however, have given an effective and relatively economical method of seismic surveying. Some of the features contributing to the improved results are:

- Selecting a low frequency response and a spread with supermultiplication of geophones and shots, up to 100 holes per shot point together with more than 100 geophones per trace.
- Fitting the scale of data representation to the amplitude of the geological phenomona.
- Selecting a low-cost, safe, and easy-to-use explosive.
- Drilling with compressed air, wagon-jack, etc.

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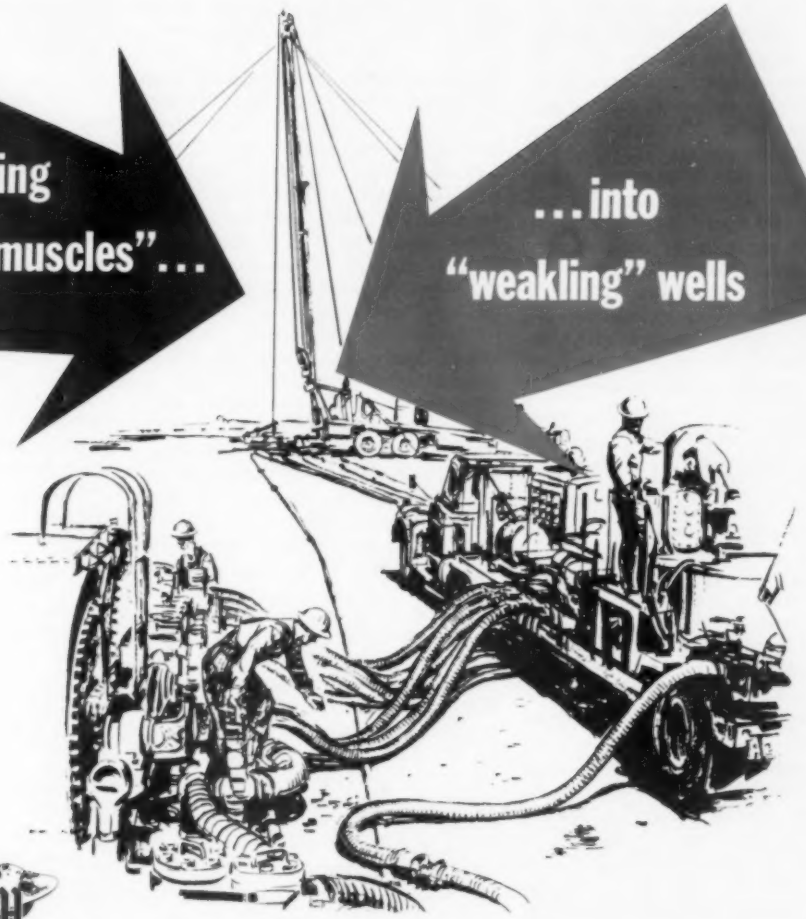
...into "weakling" wells



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PIONEERS IN FRACTURING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Turkey, too, is coming into the foreground in foreign exploration circles. S. Diker, employed by the Turkish Government, will present the results of regional gravity and magnetic surveys in south and southeast Turkey, covering some 6,000 sq. miles. During 1955 and 1956, the author supervised additional surveys in central Anatolia and in Thrace (European Turkey), covering 13,000 sq. miles in regional surveys and about 4,000 sq. miles in detail. Diker will discuss the relation of the various anomalies to regional geology. In general, he concludes, the structural and sedimentary conditions are favorable for the accumulation of oil.

Caribbean operations . . . Henry L. Grant, party chief with Western Geophysical Co. of America, will discuss offshore seismic exploration in the Caribbean. According to Grant, the Caribbean Sea presents every conceivable challenge that can be encountered in marine seismic operations. Crews must be able to switch on short notice from reflection surveying to refraction. Record sections are an invaluable aid to interpreting the complex structure of the region.

Cuba and Jamaica with their complex geological and geophysical problems present a real problem to the oil finder. Carl Savit will tell the S.E.G. in a paper entitled "Seismic Operation in Cuba and Jamaica." Savit will discuss the geology and geophysical headaches of these two islands where sediments from Lower Cretaceous to Miocene age or younger overlie a fantastically complex basement. Among the situations present are near-surface cavernous limestones, reefs, multiple overthrust sheets, and even virtually undisturbed basins. Reflection quality ranges from excellent to N.R. Highlight of Savit's talk will be several geologic sections and seismic record sections.

Guatemala is becoming the scene of an active oil hunt and Henry H. Nogami, Guatemalan Atlantic Corp., will report on the results of the first seismic effort in Guatemala. Nogami concludes that much of the area of interest can be mapped with seismic surveys.

The ability to get along with people is the most important asset that an oil finder can have, next to technical competence. This is the conclusion reached by R. E. McMillen in his paper, "Orientation of Personnel in Global Operations." McMillen plans to discuss some of the problems that develop in foreign operations because of differences in language, religion, race, and mode of life. International companies recognize these problems and give their employes orientation courses prior to or at the beginning of foreign duty.

Gravity surveys . . . Frederick Romberg with Geophysical Service, Inc., will discuss "The Key Variables in Gravity Interpretation." These are the magnitude, sign, sharpness, elongation, and resolution of gravity anomalies. The variables are determined by the depth, shape, separation, and density contrast of the geologic features causing the anomalies, according to Romberg. The relations between the two sets of variables, gravity and geologic, are well known. However, Romberg will classify these relations and compare them for reference for different kinds of anomalies. He will present examples where the inherent ambiguity of the gravity sets the limits on deduction of geologic facts from gravity data. Romberg will also compare the effects of different vertical distributions of density on various types of gravity anomalies.

During the past 2 weeks, the Department of Geophysics of the University of Utah has made a regional gravity survey of the northern part of Utah. Kenneth L. Cook and Joseph W. Berg, Jr., will summarize the results obtained to date. The surveyed area lies along the eastern part of the basin and range provinces. The gravity patterns correspond well with known basin and range faults and reveal many newly discovered faults of this type.

The gravity indications of major faults along the margins of several mountain ranges lend support to the fault-block theory of mountain building in this part of the basin and range province. The Wasatch Mountains are shown to be a horst, as Gilbert believed. And a great structural trench, about 150 miles long, lies immediately west of the Wasatch horst.

John A. Masters, Schlumberger Well Surveying Corp., Midland, Tex., will present a paper, "Resistivity Well Logging." This is a method of obtaining reservoir characteristics by means of electrical measurements. Primary uses of resistivity logs are:

- Correlation.
- Lithologic study and interpretations.
- Qualitative and quantative interpretation of reservoir characteristics.

Modern macro-resistivity logging comprises the electrical log, the laterolog, and the induction log. Masters will discuss the uses and limitations of each in his talk.

Research, experimentation, and instrumentation . . . The longhaired side of the science will have its day at the convention. Geophysicists with Gulf Research & Development Co., Pittsburgh, will discuss experimental results on the factors affecting elastic wave velocities in porous media. M. R. J. Wylie and A. R. Gregory are authors of the paper and will show the effects of oil and gas saturation on velocity as well as other factors. Wylie and Gregory conclude that saturation effects are comparatively minor. However, they point out that the continuous velocity data coupled with electric-log analysis are generally valuable, particularly when the bore hole is drilled with oil-base mud.

H. L. Mendenhall, Phillips Petroleum Co., Bartlesville, will present a paper entitled "Notes on Refinements in Refraction Technique, and Adaptation to Near Surface Corrections." Near-surface conditions can seriously alter the travel times of the deeper reflections. Frequently these conditions are below the depth of economic shot-hole drilling. The salt problem of the western Anadarko basin is one area where these unfavorable near-surface conditions exist. Mendenhall will describe some refinements in the reversed inline refraction profiling technique that help overcome these problems.

Synthetic reflection records are of particular value in identifying seismic reflecting horizons. And field techniques can be guided by synthetic record studies. Howard R. Breck, Noel Frost, and S. W. Schoellhorn, Seismograph Service Corp., Tulsa, will present a paper at the convention entitled "Synthetic Seismic Reflection Studies." The authors feel that these studies promise to be the key in detecting strat traps with seismograph surveys. **End.**

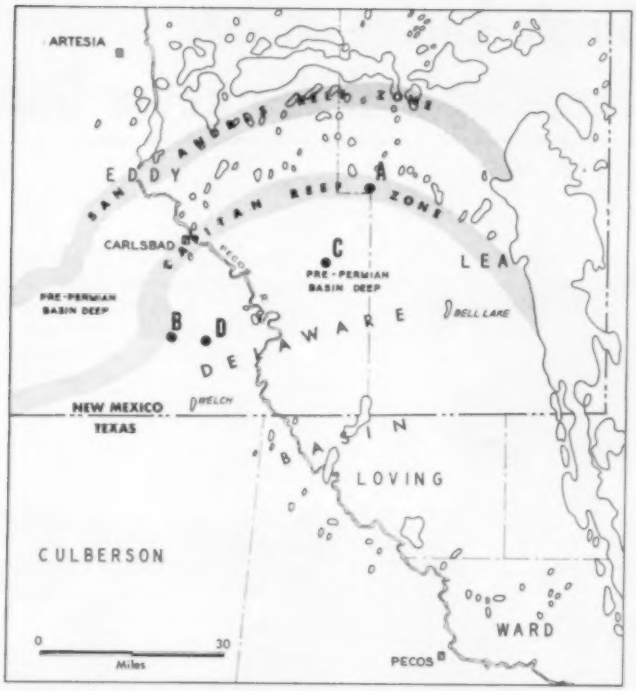
BOOKS

GEOLOGY AND PETROGRAPHY OF THE STENDEL PERLITE DEPOSIT, SOCORRO COUNTY, NEW MEXICO by Robert H. Weber. Published by New Mexico Institute of Mining and Technology and State Bureau of Mines and Mineral Resources.

Perlite, the volcanic glass that may be expanded by appropriate heat treatment to a cellular material especially valuable for lightweight plaster aggregate, has become the basis for an industry of significant economic importance in New Mexico. Production in 1956 was worth $1 million. This report summarizes the preliminary results of study of perlite deposits in New Mexico.

HIGH-PURITY DOLOMITE DEPOSITS OF SOUTH-CENTRAL NEW MEXICO by Frank E. Kottlowski. Published by New Mexico Institute of Mining and Technology and State Bureau of Mines and Mineral Resources.

The object of this preliminary estimate of high-purity dolomite deposits in New Mexico is to bring to the attention of producers and consumers of magnesium and magnesium compounds the large reserves of high-purity dolomite within the state. These reserves (almost unlimited deposits) occur in south-central New Mexico, in the area from the Sacramento Mountains west to Deming and from the northern tip of the San Andres Mountains south to Mexico.



CURRENT TESTS being watched in southeastern New Mexico are indicated on the map as A, B, C, and D in Eddy and Lea counties.

Pre-Permian basin deep . . .

New Mexico Activity Moves South

By Carl Hoot
District Editor

DEEP exploratory efforts once more are turning southward in the Southeast New Mexico portion of the Permian basin. This is the area geologically described as "pre-Permian basin deep"—an area considered high in percentage of favorability for petroleum accumulations.

The wells listed here and noted on the map are in this region. Their outcome will have an important bearing on a big area that is relatively untried, insofar as the pre-Permian possibilities are concerned. They are indicated on the map as A, B, C, and D, in Eddy and Lea counties.

"A" on the map is The Texas Co. 1 Richards, in 25-20s-32e. No. 1 Richards has shown a fair amount of gas over a 200-ft. Ellenburger section, plus a spray of distillate in the upper part of the formation. It is one of the few wells to find a thick Ordovician section.

Gas Volume

Top of the Ellenburger was 16,215 ft., on elevation of 3,603 ft. Subsequent tests and results were: Gas surfaced in 40 minutes, water blanket with spray of distillate in 2 hours and 20 minutes, on test at 16,200-80 ft. Gas volume was at the rate of 170,900 cu. ft. per day. Gas volume increased to around 340,000 cu. ft. between 16,280-16,330 ft., and at 16,330-16,415 ft. gas flow was up to 353,000 cu. ft.

An earlier test, apparently Devonian, from 14,515-14,635 ft., flowed at the rate of 1,761 M.c.f. per day through 11/64-in. choke. Other shows were logged back up the hole, to the Bone Springs around 6,534 ft. No. 1 Richards started as a Devonian test, to 14,250 ft., but now apparently is drilling ahead to the pre-Cambrian.

"B" on the northwestern side of the basin is Union Oil Co. of California 1-26 Crawford, in 26-24s-26e. A test from 9,968-10,057 ft., tentatively called Pennsylvanian, had gas in 8 minutes, at the daily rate of 6,000 M.c.f. The well blew out as it was being shut in. Fire destroyed the rig and delayed operations several days. At last report it was again active, circulating for samples at 10,688 ft. Shows of both oil and gas were logged in a thin stringer at 10,686-88 ft.

"C" on the map is Shell Oil Co. 1 James Ranch, in 36-22s-30e. The pool shown a few miles to the northwest of it is a lone Delaware sand producer.

Shell's test made gas flows of around 3,000 M.c.f. on tests at 14,927-15,601 and again at 14,926-15,688 ft. Flowing pressure on the first interval ranged from 2,340-1,870 psi., and 6,345 psi. when shut in.

A test at 15,764-15,937 ft., identified as Devonian, developed salty sulfur only, and at 16,322-16,433 ft. recovery was 6,400 ft. of gas and salt-water-cut mud. Drilling continued below 16,677 ft.

"D" on the map is Tennessee Gas Transmission Co.'s location for 1-A John M. Kelly-State, 34-24s-37e. It is to be a 13,500-ft. Devonian wildcat. Location is 5 miles southeast of Union Oil's well.

Producing Areas

Geologically, Southwest New Mexico's producing areas fall into the following groups, running south from the shelf areas, or roughly the northern border of Chaves County: Pre-Permian shore, pre-Permian shelf-shore, pre-Permian intermediate, and pre-Permian basin deep. It is the pre-Permian basin deep area that is now coming in for study and exploration by the drill.

Reference here is made to an article by Phil D. Helmig (OGJ, Oct. 20, 1952). A portion of the description of these environment zones of a sedimentary basin are:

"The Basin Deep, or sea channel area below wave base where there is little disturbance and deposition of fine sediments by settling or precipitation takes place.

"The Intermediate area lying between the Basin Deep and the shelf-shore areas where both clastics and carbonates mingle, lying near wave base.

"The shelf-shore area or strand-line area above wave base where considerable disturbance and clastic deposition take place on the shelf and near the shore line.

"The greaest petroleum source-bed manufacturer probably is the basin deep-sea area, because there is no oxidation in the deep water, no scavenger animals present to remove organic material—nothing to alter the abundance of accumulation of organic material . . ."

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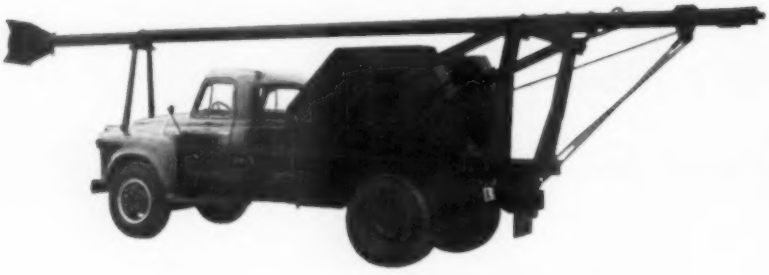

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EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

Confirmation to Newton Area Reported Successful

An oil pool, northeast of Roseville in Newton Township, Muskingum County, was confirmed by the Buck & Waters 2 Eugene Good, Section 25. Clinton sand logged at 3,732-85 ft. made 5 bbl. and 150,000 cu. ft. gas natural and 264 bbl. and 250,000 cu. ft. gas after fracture.

Second Well Finaled In Extension Area

The second well to be completed in the extension to the New Lexington pool gaged 120 bbl. in a 5-hour test 7 days after fracture. Natol 1 George Hillis, Section 22, Pike Township, Perry County, found the Clinton at 3,394-3,421 ft. with 5 bbl. natural.

Ashtabula Discovery Flows Oil to Tanks

● The Benedum-Trees 1 T. J. Scribner, Lot 26, Monroe Township, Ashtabula County, flowed 151 bbl. oil into tanks during a 24-hour test. The company has staked a second test 1,000 ft. distant.

PENNSYLVANIA

Rank Streams Wildcat Is Failure in Indiana County

In Washington Township, Indiana County, Southwest Pennsylvania, Columbian Carbon Co. 1-1844 Silas C. Streams, rank wildcat, was a failure, chert 7,443-7,722 ft., salt water 7,483 and 7,514 ft., show of gas 7,491 ft., Oriskany sand 7,722 ft., total depth 7,740 ft.

● In Buffington Township, this company's 1845 Bethlehem-Cuba Iron Works Co. is drilling in the chert at 8,185 ft.

WEST VIRGINIA

Dry Fork Wildcat Is Gas Discovery

Dry Fork district, Randolph County. Hope Natural Gas Co. 10077 U.S.A. Dept. of Interior wildcat, elevation 3,333 ft., had a final gage of 2,014,000 cu. ft. gas after fracture in Oriskany sand, chert 5,466 ft., gas 5,493 ft., Oriskany sand 5,617 ft., gas 5,645, 5,734 and 5,793 ft., total depth 5,968 ft.

● Slate district, Wood County, this company's 10118 George B. Neal, elevation 633 ft., was dry in the Oriskany sand, total depth 5,102 ft.

EASTERN KENTUCKY

On Rockhouse Branch of Peter Creek in Pike County, United Fuel Gas Co. is drilling at 1,780 ft. in red shale at their wildcat 27 Kentland Coal & Coke Co. Elevation of test is 1,111 ft.

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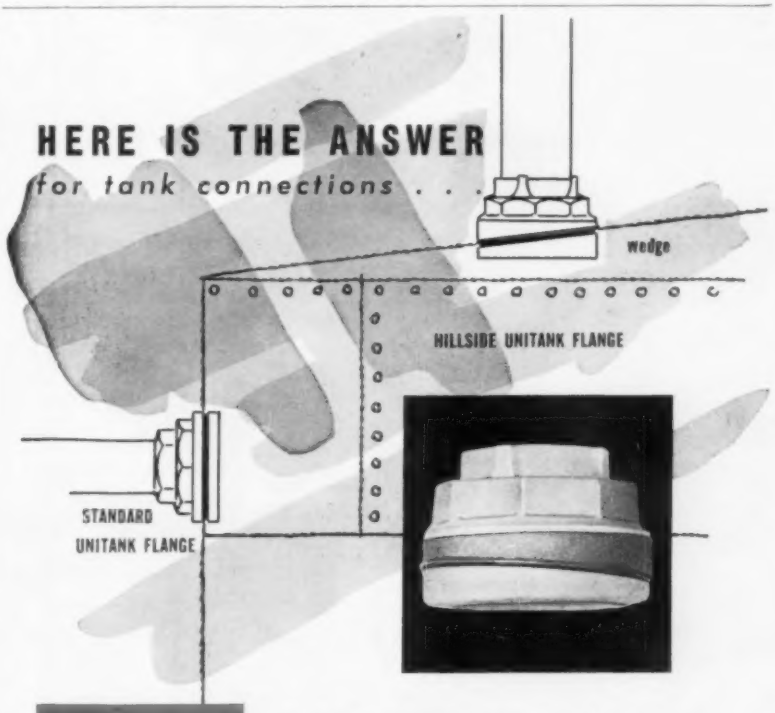

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The ENARDO Unitank Flanges are made to fit either flat decks (Standard) or sloping decks (Hillside). They are cast of sturdy metal, precision machined, easily installed, and economical because of labor saved at installation. The "Hillside" flange consists of a body, wedge, and retaining nut, designed for connections on the slope of standard tank decks. This flange keeps all overhead piping vertical. Not at an unknown angle, i.e. a standard flange on sloping deck. (See illustration.) The "Standard" flange consists of a body and retaining nut. It is designed for installation on all tank walls. On both type flanges, body extends through tank plate from the inside with gasket between body and plate. Retaining nut is tightened from outside (see illustration). Left-hand threads are machined on both body and retaining nut; this causes the flange to tighten instead of loosen when receiving standard pipe, from either the inside or outside. Only one hole needed for "Hillside" or "Standard" flanged installation. Both flanges have had universal acceptance in the oil fields.

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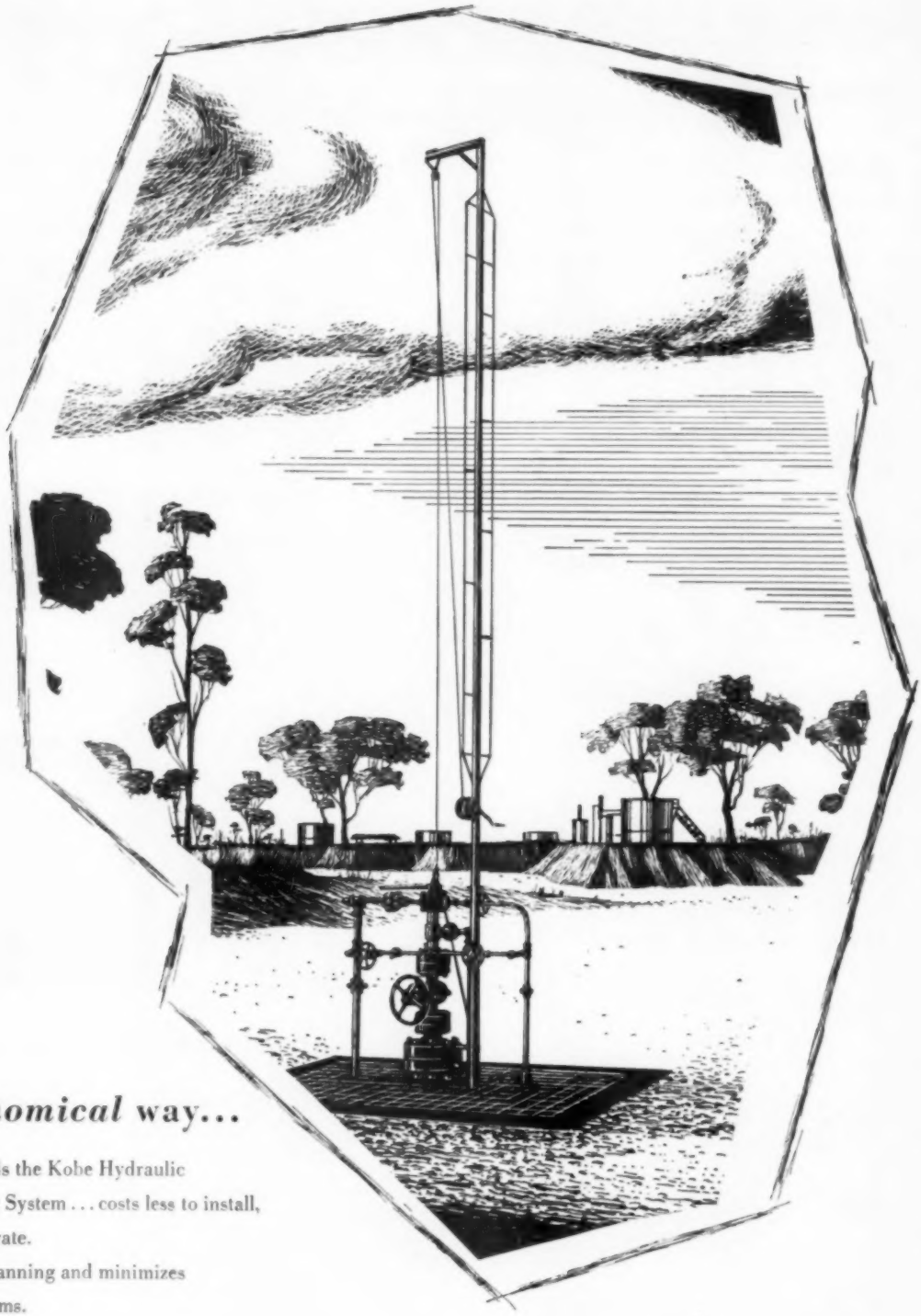

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CALIFORNIA

Texaco Gets Good Producer at Fillmore

The Texas Co. completed 1 Sespe-McNab in NE NE 25-4n-20w as the Fillmore field's latest eastern extension. It was brought in flowing 518 bbl. daily of 32.5°-gravity crude through a 29/64-in choke from an interval at 13,767-13,839 ft. and 13,919-67 ft. Total depth is 13,991 ft. This deep field in eastern Ventura County is now one of the most active in the state with six rigs working at the last count.

Universal-Consolidated Completes New Movie Well

Universal Consolidated Oil Co. reports it has completed its first well drilled from the second drill site the company has on the 20th Century-Fox Movie lot in West Los Angeles. While the operator didn't release specific details, the well is bottomed as an offset to 8 20th Century which was drilled and completed from the old drill site 500 yards east of the new site. The new well, 1A Community, probably has a potential of around 900 bbl. daily, based on the performance of 8 20th Century. It has been shut in pending completion of tankage and pipeline connections.

Universal also reportedly is nearing a new pool discovery in the Gosford field region of Kern County with a wildcat in SW NW 19-30s-27e. On a ½-hour formation test on an interval at 9,702-24 ft., with a 1,500-ft. water cushion, it experienced a light blowout throughout the test.

CANADA

ALBERTA

Cal-Standard Finds Devonian Oil at Red Deer

The California Standard Red Deer area test, which lies only ⅝-mile northeast of that city's limits, was assured of success during the initial test run in the D2 zone of Devonian, as an estimated 5,500 ft. of clean oil was recovered upon completion of a drill-stem test. Other tests run below the first evaluation indicated further pay and an indicated 45 ft. oil bearing structure is present.

This well, Cal Standard 4-26-38-27, Red Deer, was drilled on LSD 4, 26-38-27w4. It is 2½ miles due south of previous D2 oil production (drilled within the limits of the Joffre Viking sand oil field) and is about the same distance west of another Cal Standard

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discovery 10-20 Hillsdown—that discovered oil some time ago in the basal quartz structure.

Drill-stem tests which indicated discovery were run below the 7,100-ft. level and as well as giving up substantial recoveries of clean crude, also flowed that product to surface at rates as high as 38 bbl. in 2¼ hours.

Production casing has now been run in the hole and crew of the drilling company's rig employed at the venture were running logs at last report, after which, the rig will be moved ½ mile due north for the company's initial follow-up attempt.

Third Pay Opened at Stolberg Discovery

The Central Foothills Agreement Group's Stolberg 6-10A exploratory test in Central Alberta, is becoming a prolific gas discovery as another zone, the third, in the Rundle section of the Mississippian has flowed natural gas at an indicated commercial rate. Included in this group, which controls approximately 1,300,000 reservation acres along the Rocky Mountain front in this province, are the Triad Oil Co., British American Oil Co., Ltd., Royalite Oil Co. and Sun Oil Co.

It will be remembered that this well, 6-10A Stolberg, on LSD 6, 10-42-15w5, flowed gas from the first Rundle section at a rate of 8,500,000 cu. ft. daily; while the second zone in that formation, encountered about 1,300 ft. below the first, gassed at rate estimated between 8 and 10 million cubic feet daily. The latest drill-stem test, meanwhile, run in the third Rundle section flowed at a calculated rate of 3,500,000 cu. ft. per day. That test covered a 135-ft. interval below 13,350 ft. and it is thought that the zone will be fully penetrated shortly after which the Devonian, proved gas bearing at the team's Lambert Creek area test, 70 miles northeast of this venture, will be encountered.

Cardium Well Found In Keystone Area

A Calgary based Canadian independent oil company, Klintar Oils, Ltd., this week indicated crude oil success from the Cardium sand at its third wildcat discovery in the Keystone producing area of central-west Alberta. This is the eighth try in the area for the firm (five of which were development wells) and all of those have resulted in commercial success.

The newest of the strikes, Klintar 16-10-49-5 Lyndale, was drilled on LSD 16, 10-49-5w5. It is 3 miles west-southwest of the Decalta-Poplar 8-18

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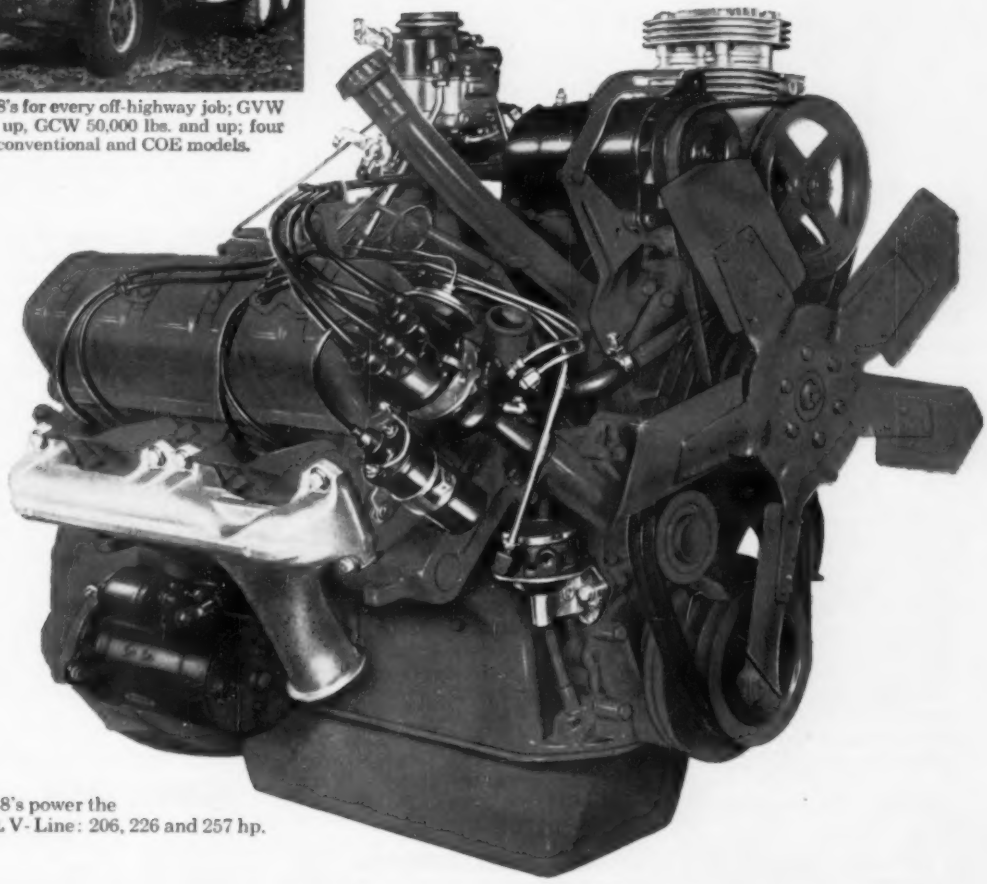

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Keystone successful step-out venture and about the same distance northwest of oil production in Keystone field.

The Cardium sand at this venture was not drill-stem tested, but on the basis of core analyses and electro-log interpretation, a commercial well is indicated as a 29-ft. pay sector was present in the formation.

Production casing has been run on the well and further test evaluations will be made in the very near future.

SASKATCHEWAN

Charles Discovery Reported at Pinto

A team headed by Canadian Oil Companies, Ltd., and including Colorado Oil & Gas, Ltd., and the Paramount Petroleum & Mineral Corp., Ltd., has proved success at a well in the Pinto area of southeastern Saskatchewan. This venture, during drill-stem test operations, indicated the presence of oil in the Charles sector of the Mississippian formation. Because those tests were none too encouraging, the team thought it better to wait until production tests could be run, before releasing any information on it. That program was initiated and, following an acid treatment, the well was gaged with a flow rate of 250 bbl. of oil daily.

This well, White Rose-Colorado-Paramount 16-35 Pinto, on LSD 16, 35-1-5w2, is 6 miles north of the international border town of North Portal, 10 miles due south of the closest oil production in Steelman oil field and 18 miles southeast of Estevan's city limits.

ILLINOIS BASIN

ILLINOIS

Two New Oil Pools in Illinois in September

Two new pools, Deering City in Franklin County and Roby West in Sangamon County, were discovered in Illinois in September. Only one producing well has thus far been completed in each of the two pools. A south offset to the Roby West well was completed as a dry hole.

There were extensions to 10 pools: Aden Consolidated and Johnsonville West in Wayne County, Chesterville East in Douglas County, Dale Consolidated in both Hamilton and Saline counties, Harco in Saline County, Huey in Clinton County, Inman East Consolidated in Gallatin County, Main Consolidated in Crawford County, and Patoka and Salem Consolidated in Marion County.

The slight increase in the rate of oil well drilling experienced in August continued through September. A total of 252 wells were completed during September, an average of 63 per week in comparison with 79 per week in September 1956. Of the 252 completions 120 are oil wells and 2 are gas wells, or 48 per cent successful. White and Marion counties had the most drilling with 26 and 25 completions, respectively.

The estimated production for September is 6,690,000 bbl. as compared with 5,059,000 bbl. in August and 6,716,000 bbl. in September 1956. The large increase over August represents a return to normal and is the result of the settlement of a refinery strike in Ohio.

Renault Sand Discovery Seen for Jefferson Area

Kewanee Oil Co. 1 Jeff is a new Renault sand discovery in Jefferson County, 2 miles west of Ina in SE NW SE 23-4s-2e. The operator is drilling ahead after testing at 2,637-70 ft. getting 1,320 ft. of clean oil, 480 ft. heavily oil and gas-mixed mud, and 60 ft. salt water. The well also found oil in the McClosky at 2,775-88 ft. Recovery was 1,350 ft. of gas, 330 ft. of oil and 120 ft. mud and gas-mixed oil. Another test in the McClosky at 2,774-94 ft. got 1,530 ft. of gas, 450 ft. of oil, and 120 ft. mud and gas-mixed mud.

WESTERN KENTUCKY

Completions Due at New Henderson Wildcat

Slagter Producing Co. is completing its 1 T. P. Sights wildcat, 2 miles north of Niagara in 4-O-25, Henderson County. The well is both an O'Hara and McClosky discovery. It swabbed 7 bbl. of oil per hour after acid treatment from the McClosky at 2,513-16 ft.; and 2 bbl. per hour, natural, from the O'Hara at 2,413-19 ft.

KANSAS

SOUTHWEST

Southwestern Strikes Wait on Potentials

Northern Natural Gas Co. 1 Flagel "A," C NW SE 2-31s-29w, 1 mile

Another Meade County wildcat, Skelly Oil Co. 1 Mohler, SW SW SW 35-33s-29w, 1½ miles east of Singley field and 11 miles southeast of Plains, swab tested 15 bbl. of oil per hour for 8 hours. Production is from the Morrow topped at 5,718 ft.

south of Hockett pool and 6 miles northeast of Plains, flowed 38 bbl. of oil on tests from perforations in the Morrow-Pennsylvanian at 5,545 ft. The operator is now waiting on state potential.

LOUISIANA

NORTH

Tuscaloosa Discovery Finaled In Franklin Parish

Franklin Parish has a new oil discovery at States Oil Co., Inc., 2 L. M. McIntyre et al in C NE NE SW 31-16n-9e, 1⅜ miles northeast of Lamar gas field. The well flowed 79 bbl. of oil per day, 42° gravity, on 10/64-in. choke. Perforations were at 4,682-88 ft. in the Tuscaloosa.

Claiborne Parish Wildcat Is Good Oil Strike

Pan American Petroleum Corp. has completed a wildcat well for production in northern Louisiana.

Pan American 1 Tanner, located in 22-21n-4w, Claiborne Parish, flowed 324 bbl. of oil and 1,450,000 cu. ft. of gas a day through a 10/64-in. choke.

Production was from the Smackover

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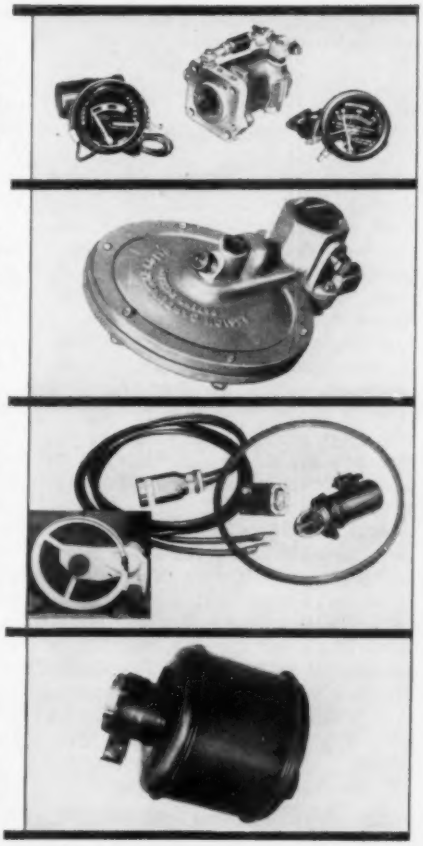

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through perforations 10,508-34 ft. Estimated pay thickness, based on core analysis, is 39 ft. Top of the Smackover is at 10,440 ft., with total depth at 10,980 ft., plugged back to 10,648 ft.

The wildcat is located in the southeast part of the old Lisbon field, which produces from the Cretaceous. Pan American owns full interest in the well and 3,520 acres in the area.

Four New Pools Opened In September Work

North Louisiana recorded four new-pool discoveries during September exploration. The oil strikes were in Catahoula, Texas, and Union parishes, with a gas discovery reported in Red River Parish. A dual-pay strike was completed at Sugar Creek in Claiborne Parish.

- Jett Drilling Co., Inc., 1 Tatum, 35-11n-11e, is the discovery well of Van Buren Bayou northwest of Locust Ridge field in Tensas Parish. The Tuscaloosa discovery flowed 114 bbl. of 52°-gravity oil per day from perforations at 9,023-29 ft. Flow was on 6/64-in. choke.
- Pan American Petroleum Corp. 1 T. L. James & Co., Inc., C SW SW 8-20n-1e, is a new Smackover strike opening Farmerville field 2½ miles south of Farmerville in Union Parish. The well flowed 229 bbl. of 67.8°-gravity oil per day on 11/64-in. choke from Smackover perforations at 10,354-68 ft.
- Hurley Oil & Gas Co. and John Franks opened Coushatta field 2 miles northwest of the town of the same name in Red River Parish. The 1 T. J. Wilkinson, Jr., 11-12n-10w, flowed 400 M.c.f. of gas per day on ¼-in. choke from perforations at 10,014-30 ft. Pay is the Nacatoch.
- A. J. Hodges Industries, Inc., and and Union Producing Co. found a dual gas pay well in Cotton Valley sands at the A-1 Simms Unit in Sugar Creek field, Claiborne Parish. The well flowed 2,500 M.c.f. per day at 8,780-95 ft. in the Vaughn sand plus 50-60 bbl. condensate per million. From the Bodcaw at 8,724-30 ft. it made 8,000 M.c.f. per day plus 50-60 bbl. condensate per million.

SOUTH LOUISIANA

South Washington Field Gets Confirmation Well

Sohio Petroleum Co. is confirming its recent new-field discovery, 3 miles south of Washington field, at its second well in the area.

The confirmation well, 1 Fontenot Unit 2, productive from a slightly deeper pay than that of the discovery producer, tested a flow of 73 bbl. of 46°-gravity oil per day. Flow, through small chokes, was under pressure of 2,725 psi. and with gas-oil ratio of 5,810 cu. ft. per barrel.

Pay is perforated at 10,034-37 ft. with bottom of hole at 10,351 ft. Sohio's discovery well, 1 Fontenot, completed last June, is productive at 9,964-70 ft. The area designated as South Washington field, is about 3 miles south of Washington field.

Bayou Raphael Stepout Opens Deeper Pay Zone

Mississippi River Fuel Co. and California Co. have extended their Bayou Raphael field, in Lafourche Parish, about 1½ miles east and a little north.

Their extension well, 3 Louisiana Land & Exploration, opens a new pay, perforated at 12,016-44 ft. Their discovery well, completed a year ago, was completed in an 11,100-ft. zone.

Flow of the new well is at the rate of 84 bbl. of 47.5°-gravity oil per day through ⅞-in. choke. Pressure is 3,600 psi., and gas-oil ratio 2,700 cu. ft. per barrel.

Location is about midway between the field's discovery well and East Golden Meadow field.

Montegut Extension Test Completed as Producer

Production in the new Montegut area, 15 miles down Bayou Lafourche from Houma, in Terrebonne Parish, is being extended about a mile west.

Extension is by Southern Natural Gas Co. at its 4 South Shore, completed making 166 bbl. of 56°-gravity condensate with 6,000,000 cu. ft. of gas per day. Pressure through ¼-in. choke was 4,500 psi.

The extension well is the third for the area, opened last June. Its pay, in hole drilled to 13,125 ft., is perforated at 11,886-11,910 ft. Other wells are in a 12,100-ft. sand.

Location of the area is about 1½ miles north of the large Lirette gas area.

Jefferson Davis Wildcat Uncovers New Deep Field

A significant new discovery is indicated in southeastern Jefferson Davis Parish.

It is by Tennessee Gas Transmission Co. at its 1 Morgan Plantation, in 38-11s-4w, completed as a Camerina producer flowing 250 bbl. of oil per day through ⅛-in. choke with pressure of 5,100 psi. Pay is perforated at 12,808-10 ft.

The discovery is about 5½ miles south of the prolific multiple-pay Lake Arthur field developed by Union Oil & Gas Corp. It is about 2 miles north of a deep gas well completed by H. L. Hawkins in 1955. The latter, designated as South Lake Arthur field, has been shut in since completion. Tennessee's well is on a lease block of 1,806 acres.

Allen Discovery Well Flows Gas-Condensate

Caroline Hunt Sands' new discovery well northwest of Oberlin, in Allen Parish, flowed 33 bbl. of 53.5°-gravity condensate with 975,000 cu. ft. of gas per day on its potential gage through 5/32-in. choke.

Flow was under pressure of 2,020 psi. with pay perforated at 9,240-46 ft. Total depth is 9,500 ft.

The well, 1 Broussard, opens a new field 3 miles from nearest other production. The latter is in Pilgrim Church field, discovered last April by H. L. Hunt and others with gas-condensate production from a 9,400-ft. zone.

LOUISIANA OFFSHORE

Dual-Zone Well Confirms New East Cameron Field

Mississippi River Fuel Corp.'s newly completed confirmation well in its East Cameron Block 9 field, 3 miles off shore from Cameron Parish, opens two additional sands in the field

The well, 2 OCS-089, is dually completed with perforations at 12,804-24 ft. and 12,492-12,532 ft. It is rated good for 5,150,000 cu. ft. of gas per day through 7/32-in. choke from the lower zone, and 6,000,000 cu. ft. per day through ¼-in. choke from the other. Liquid recovery is 17 bbl. per 1,000,000 cu. ft. from the former, and 12 bbl. per 1,000,000 from the latter.

Discovery well was dually completed from pays at 13,056-13,120 ft. and 12,902-20 ft., both productive of gas and condensate.

Associated with Mississippi River Fuel as joint operators are Ocean Drilling & Exploration Co., Hope Natural Gas Co., and others.

Production Opened In New Ship Shoal Area

Shell Oil Co.'s new gas discovery in Block 139, Ship Shoal area, 20 miles off the coast of Terrebonne Parish, opens Louisiana's eighteenth offshore field to be found this year. The number is only six shy of equalling the total number of offshore fields discovered last year.

Shell's discovery well, 1 OCS-0587, is completed in pay at 12,768-82 ft.

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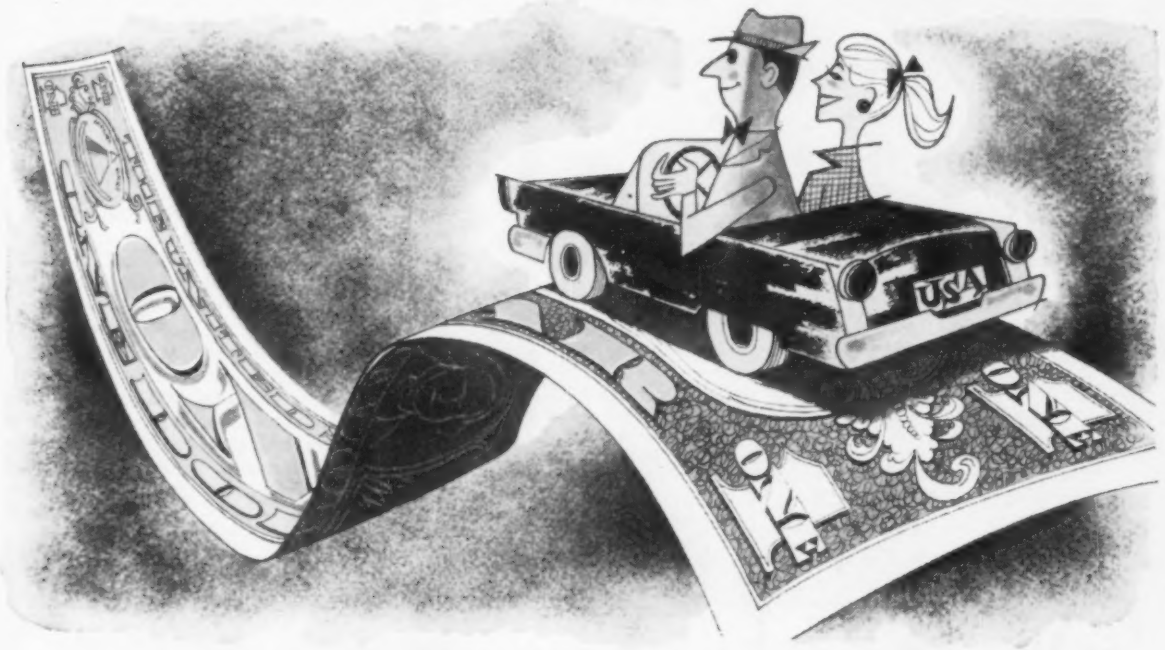

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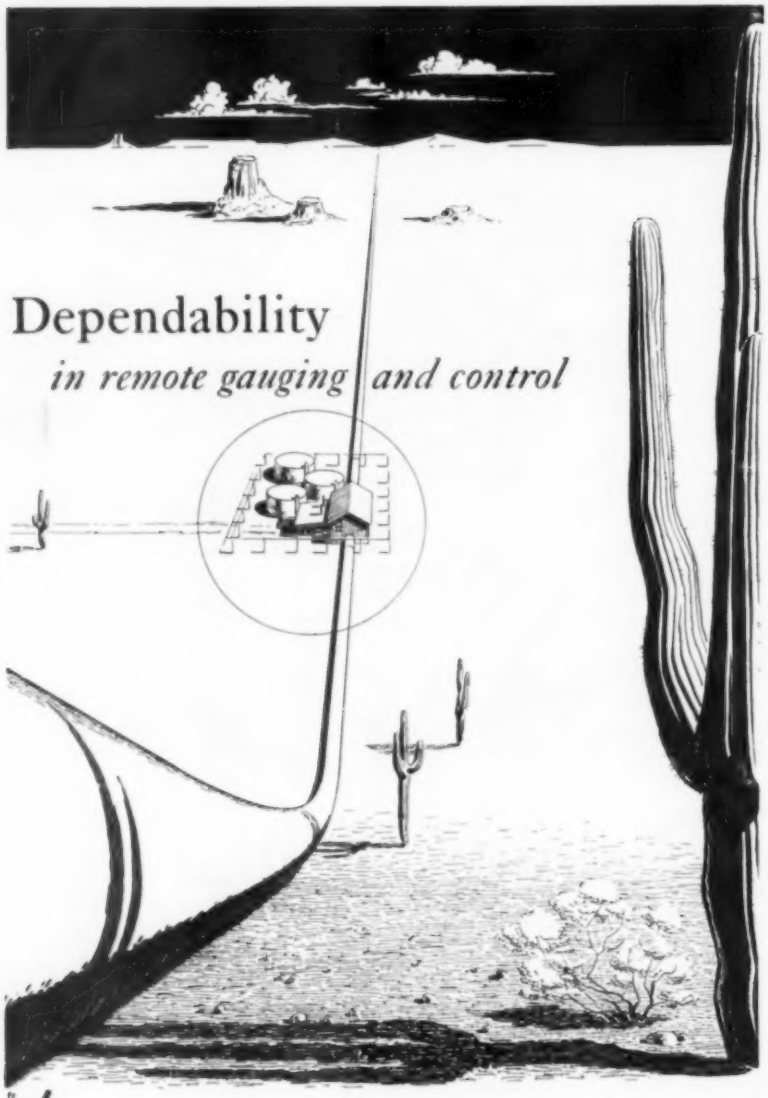

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after being drilled to 15,006 ft. Its flow was gaged at 2,543,000 cu. ft. of gas and 168 bbl. of 61.4°-gravity condensate per day through ¼-in. choke. It had pressure of 2,500 psi.

Location is about 8 miles from nearest other field.

MICHIGAN

First Production for Ingham County Seen

Michigan prospects continued to look up with a probable new pool discovery in Ingham County, 12 miles east of Lansing, the state capital, and the first field prospect in the county.

Three Lakes Oil Co. 1 Clark, SE SW NW 2-4n-1e, Williamston township, carried a hole full of oil from Traverse limestone at 2,440-51 ft. Top of formation was logged at 2,419 ft. and drilling halted to set 6-in. casing to pay. On bailer test well failed to flow but continued to hold fluid level to top of hole.

Trenton Well at Scipio Flows Gas

At least mild disappointment hit the booming Scipio field play in Hillsdale County when C. A. Perry 1 Martin, NW SW NW 11-5s-3w, 1,320 ft. east of the field discovery, bottomed out in Trenton limestone at 3,934 ft. showing estimated 5,000,000 cu. ft. gas but only show of oil. Four other completions in same horizon have completed for oil. Four rigs currently are running in field.

Newaygo Wildcat Logs Traverse

D. B. Van Raalte 1 Nordwall, NE NW NE 30-12n-14w, Newaygo County, wildcat, logged Traverse at 2,117 ft. and cored 2 ft. oil saturated limestone. Casing was set for test. Wildcat is 10 miles southwest of Kimball Lake pool.

NEW MEXICO

SOUTHEAST NEW MEXICO

Wolfcamp Discovery Assured For Northern Lea County

Union Oil Co. of California 1-6 R. W. Duncan, wildcat 3 miles southwest of Tatum in 6-13s-36e, Lea County, reported several flows of oil from the Wolfcamp. On 16/64-in. choke, the well gaged 36 bbl. of oil in 2½

hours, then made 66 bbl. in 8 hours through 12/64-in. choke. Perforations at 10,360-64 ft. had been acidized with 500 gal. Perforations at 10,331-45 and 10,385-98 ft. flowed 12 bbl. of oil in 1 hour through 16/64-in. choke. Tubing pressure was 1,035 psi. and gas-oil ratio 889:1. Union's test was drilled to 14,393 ft., total depth, but reported only light shows in dolomite below 14,195 ft.

Dual pay prospect . . . Tidewater Oil Co. 8-C Coates was testing two new pay zones in the Justice (deep) field east of Jal in southwest Lea County. From McKee sand perforations at 7,325-72 ft. the well flowed 131 bbl. in 8 hours through ½-in. choke, with tubing pressure of 90 psi. and gas-oil ratio of 960:1.

Operator was swabbing from perforations in the Tubb at 5,930-62 ft. with no report on the amount recovered.

The firm's 9-C Coates-Federal, twin well to Tidewater's Ellenburger discovery in the field, flowed an undisclosed amount of oil from the McKee sand at 7,173-7,383 ft., and from the Tubb at 5,920-6,000 ft.

On the north side of the field, Gulf Oil Corp. 3 Learcy McBuffington completed for 455 bbl. of oil a day from the Ellenburger at 8,100-81 ft. Choke was 12/64-in.

Eddy County Discovery Is Pennsylvanian Opener

Standard Oil Co. of Texas has completed its 1 J. H. Everest as a Pennsylvanian gas-distillate discovery, about 6 miles southeast of Artesia, between the Atoka and Dayton fields.

On completion potential, calculated open flow was 23,000 M.c.f. of gas, plus 276 bbl. of 55.8°-gravity distillate. Perforations were between 9,089-93 and 9,095-9,116 ft. Total depth was 10,542 ft., plugged back to 9,370 ft. Location is in 14-18s-26e. Nearby production ranges from the Grayburg to the upper San Andres.

OKLAHOMA

PANHANDLE

All Three Counties Figure in Development

Beaver, Cimarron, and Texas counties all figure highly in development and exploratory success in the Oklahoma Panhandle.

Beaver . . . A new pay discovery in Highland field is United Producing Co.

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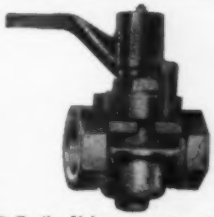

DeZurik Valves operate on an exclusive eccentric principle. The plug face contacts the valve body *only* when the valve is closed.

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SARTELL, MINNESOTA

5 Carlisle in SE NW 23-3n-28eCM. The Checkerboard yielded 3,000 ft. of clean oil on drill-stem test from 6,000-50 ft. Most wells in this area have had high potentials on completion. One such well is Shell Oil Co.'s 1 Thorn in SE NW 32-3n-26eCM. It flowed 55,000 M.c.f. of gas daily from Tonkawa sand at 5,715-51 ft.

Cimarron . . . Six pays are in evidence at The Texas Co.'s closely watched strike in southeastern Cimarron County in the extreme northwest part of the Panhandle.

The 1 Youtsler, SW NW SE 23-1n-9eCM, has found production in the Wabaunsee, Lansing-Kansas City, Marmaton, an unknown pay zone, Morrow, and the Mississippian lime.

Texas . . . This middle Panhandle county is in the midst of a real boom in pre-Permian development.

Cities Service Oil Co. 1 Murdock is a typical deep inside Hugoton well in NE SW 10-4n-15eCM. It flowed 8,080 M.c.f. of gas daily with a considerable show on test of the Morrow at 6,060-6,101 ft. More development wells are planned. Another operation, Panhandle Eastern Pipeline Co., is enlarging the new deep Morrow area at North Unity, 23-4n-13eCM.

NORTHWEST

Northwest Continues to Hold Interest Position

The northwestern counties of Oklahoma continue to hold sway over state and regional exploratory interest. Recent discoveries in Ellis, Woodward, and Major counties seem destined to put this section of the state in the most active list.

In Ellis . . . Shell Oil Co. successfully confirmed its recent Catesby field discovery in Ellis County at 1 Ohern, NE SW 32-24n-25w. The Morrow well flowed 17,000 M.c.f. of gas per day with 250 bbl. of condensate from perforations in the Morrow sand at 8,194-8,361 ft.

In Woodward County . . . Sinclair Oil & Gas Co. opened this county's fifth producing area at its 1 Gilbert in SE NW 1-23n-20w. The Morrow strike flowed 6,160 M.c.f. of gas and some distillate from perforations at 7,521-71 ft. This new pool is northeast of the city of Woodward.

In Major County . . . A rank wildcat in Ellis County opened Cottage Grove-Pennsylvanian gas production 12 miles from any pool. Pan American Petroleum Corp. 1 Harris is an important well in SE NW 13-22n-16w, having flowed 9,400 M.c.f. of gas per day from perforations at 6,207-71 ft. This strike is the easternmost in the developing region of Pennsylvanian production in this section of the state.

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ROCKY MOUNTAINS

MONTANA

Red River Discovery Finaled in Dawson

Dawson County has another Red River-Ordovician discovery at Shell Oil Co.'s 13-12 D Unit in NW SW 12-13n-55e, 4 miles northwest of Pine field.

The well was completed on pump for 220 bbl. of oil and 18 bbl. of water per day from perforations at 8,926-72 ft. This new field is about 4 miles southeast of Gas City field, a Dawson County field.

Hill County Records Another Gas Field

Empire State Oil Co. 1 Aronow, NW NW NE 7-33n-11e, Hill County, is a new Sawtooth gas discovery at 3,486-3,501 ft. The well flowed an estimated 12,000 M.c.f. of gas per day and is now shut in. Location is 5 miles northwest of Gildford and 9 miles east of Rudyard field.

NEVADA

Quit Nevada Wildcat

West End Opoteca Mines Co. and Janoil Corp. have given up on their wildcat in the White River Valley region of Nye County in east-central Nevada. The test, 28-1 U.S.L., was abandone at 688 ft.

NORTH DAKOTA

Billings County Wildcat Flows Fryburg Oil

Amerada Petroleum Corp. 1 Scoria Unit, Billings County discovery in southwestern North Dakota, flowed 231 bbl. of oil and 11 bbl. water in 23 hours on test of the Fryburg, or Madison-Mississippian, at 9,213-58 ft. Flow was through 24/64-in. choke.

The Scoria Unit wildcat recently recovered oil on tests of the Heath. Location is 4 miles west of Fryburg field and 15 miles northwest of Rocky Ridge field, a Heath discovery.

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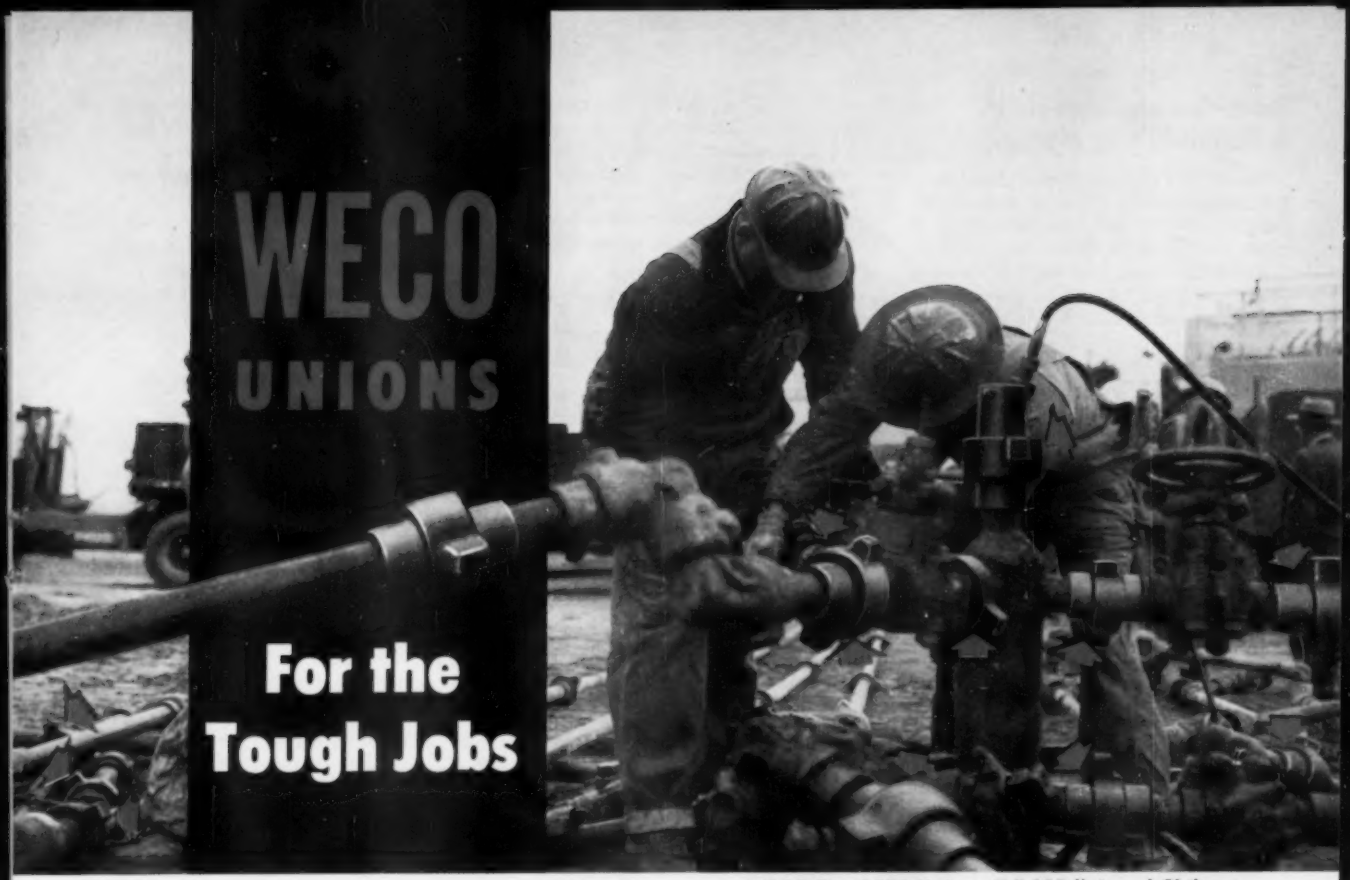
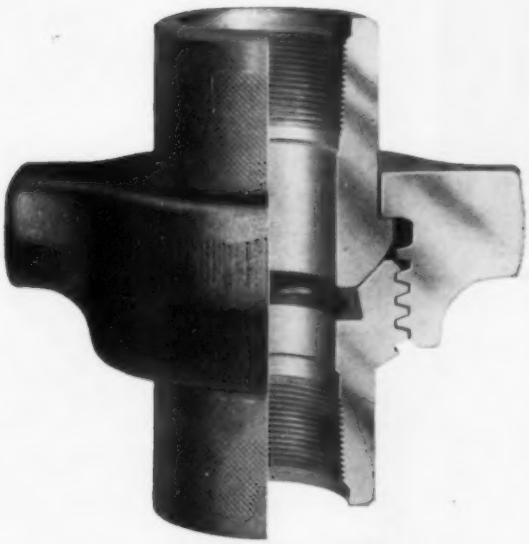
For the Tough Jobs



WECO Fig. 1502 Unions (15,000 lb.) and Chiksan XHP Joints (15,000 lb.) in use on a fracturing job.



During the course of fracturing, cementing or acidizing operations, fittings and equipment are subjected to extremes of pressures, volumes and abrasion.

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Stark County Discovery Is Completed in Madison

Leach Oil Co. et al completed the 1 Kalanek Madison discovery in Stark County, C SW NW 32-140n-96w, 2 miles northwest of Dickinson.

The well made 140 bbl. of oil, 10 per cent water, per day. Production is from perforations at 8,690-8,724 and 8,746-66 ft.

The well, located in C SW SW 5-150n-96w, made 89 bbl. of oil per day plus 16 per cent water. It produces from perforations at 9,396-9,430 and 9,440-56 ft.

Fancy Buttes lies 5 miles west of Blue Buttes, nearest production.

Fancy Buttes Wildcat Is Madison Discovery

The Texas Co. 1 Kerr is a new Madison pool for McKenzie County.

TEXAS

NORTH

Wise County Wildcat Is Caddo Prospect

Caddo production is indicated at a Wise County wildcat, the Lone Star Producing Co. 1 Tarrant County Water Board Unit No. 4, 6 miles west of the town of Bridgeport.

A drill-stem test at 4,888-4,907 ft. flowed gas at the rate of 125 M.c.f. per day, decreasing in 1 hour to 44 M.c.f. daily. Recovery was 530 ft. of oil, 90 ft. of oil-cut mud, and 180 ft. salt water. This test is in the J. Tarlton Survey, A-806.

Strawn Oil Recovered at Throckmorton Wildcat

A Throckmorton County wildcat recovered oil on drill-stem test of the Strawn sand at 4,030-38 ft. It is the Norwood Drilling Co. 1-171 Swenson Land & Cattle Co., 8 miles northwest of the town of Throckmorton in north-central part of the county.

Recovery was 240 ft. of free oil and 180 ft. heavy oil and gas-cut mud. Location is in Section 171, BBB&C Survey.

Conglomerate Oil Strike Completed in Wise County

Warren Petroleum Corp., Oil Division, opened a new conglomerate oil pool in southwestern Wise County at its 5 I. G. Yates, 3 miles east of Vineyard and 1½ miles northwest of 5,400-ft. production.

The well flowed 164 bbl. of oil daily on 16/64-in. choke from perforations at 4,064-4,114 ft. Location is in Section 8, W. Blount Survey, A-32.

EAST

Pettet Discovery Completed In Freestone County

Four W Oil Co., Corsicana, has made final tests at its new Pettet limestone discovery 3 miles southeast of Streetman in northern Freestone County.

Initial potential was 220 bbl. of 39°-gravity oil a day through ½-in. choke, from perforations at 6,970-76 and 6,992-96 ft. Flowing tubing pressure was 140 psi. and gas-oil ratio was 1,475:1. Location is in Wiley Carter Survey, A-115.

Smith County deep test . . . E. A. Carter, Dallas independent, has let contract for a 10,000-ft. wildcat 3 miles west of Tyler in central Smith County. The project is 1 W. M. Morris, located on an 87-acre tract in the Margaret Brown Survey, A-144. The main objective was said to be the Paluxy, expected at 7,500 ft., but contract depth should reach the Rodessa. Maxwell Herring Drilling Co., Kilgore, has the contract.

You'll win more than this prize. You'll increase drilling efficiency and control your mud better. Mud-O-Graf records every variation in mud weight, saving time and costly errors in the addition of weighting materials. All heavy and light streaks in the circulating system and their duration are recorded. Mud-O-Graf shows how often the hole is filled up when coming out of the hole and shows the time of a complete circulation. If it's a question of mud, ask for Mud-O-Graf.

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Rusk County . . . Coulston Drilling Co., Tyler, moved in a company rig last week to drill 1 R. E. Risinger as an 8,200-ft. test in southern Rusk County. Location is in the Jose Maria Martinez Survey, A-23, which is about 6 miles north of Cushing and 1½ miles southeast of Glenfawn townsite.

The wildcat is on a block of 1,200 acres, which was a farmout deal from Sunray Mid-Continent Oil Co.

New pay in Slocum area . . . A new Woodbine sand zone has been reported for the West Slocum field area in Anderson County. Seaboard Oil Co. 5 Harry Denson, W. R. Wilson Survey, made a dual completion from two Woodbine zones. Potential from the regular pay at 5,725-30 ft. was 124.5 bbl. of oil a day through 10/64-in. choke. The new-pay zone at 5,744-50 ft., gaged 210 bbl. a day through 11/64-in. choke.

TEXAS PANHANDLE

Humble Will Drill Lipscomb Morrow Test

Humble Oil & Refining Co. will drill an 11,090-ft. Morrow wildcat in the northeastern part of Lipscomb County, 11 miles northeast of the town of Lipscomb and 5 miles northeast of Lipscomb-Morrow field. The 1 Schultz Brothers "E" will be put down in Section 888, Block 43, H&TC Survey, 2 miles northwest of Pan American Petroleum Corp. 2 Gex, an indicated discovery well.

Confirmation Well Finaled At Lipscomb Discovery Site

Sinclair Oil & Gas Co. completed the 1 R. Paine, a west offset and confirmation well to the 1 Loesch discovery in northwestern Lipscomb County.

The Paine well flowed 5,700 M.c.f. of gas per day from perforations at 6,442-53 ft. in the Tonkawa-Pennsylvanian sand. Location is in Section 944, Block 43, H&TC Survey.

Roberts Morrow Discovery Completed by Parker

Parker Petroleum Co. has completed the 1-A Ben Hill Morrow discovery in north-central Roberts County from both upper and lower Morrow perforations.

The well flowed 7,600 M.c.f. of gas per day plus 3 bbl. of distillate per million from upper Morrow sand at 9,832-51 ft.; it made 23,000 M.c.f. per day plus 79 bbl. of distillate per million from the lower sand at 10,906-28 ft.

This new pool-opener is located ½ mile southeast of Sun Oil Co. 1 Parsell, a recent Morrow strike for 8,000 M.c.f. per day from 11,000-05 ft. Location of Parker's well is Section 146, H&TC Survey, 10 miles northwest of the town of Canadian, Tex.

WEST TEXAS

Pecos Wildcat Flows Pennsylvanian Oil

Standard Oil Co. of Texas 1 Hokit "2," Pecos County wildcat 6 miles east and slightly north of Puckett field, had better chances last week of making a good flowing discovery.

Following acid treatment with 2,000 gal., the well flowed 44 bbl. of load oil, 243 bbl. of new oil and 49 bbl. of load water in 22 hours and 45 minutes, through chokes ranging from 7/64 to 13/64-in. Tubing pressure varied from 1,350-1,550 psi. Gas-oil ratio was 7,650 : 1. Tests were being run on perforations in the Pennsylvanian at 9,428-46 ft.

This well has also made extensive tests in the Ellenburger. Operators swabbed 15 bbl. of new oil and 66 bbl.

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of water in 11 hours from Ellenburger perforations at 11,302-24 ft.

Formation tops are: Pennsylvanian limestone 8,773 ft., Ellenburger 11,166 ft. Derrick floor elevation is 3,164 ft. Location is in Section 7, Block 127, T&STL Survey. The wildcat has attracted much attention as one of the many promising deep tests in the Sheffield channel area of southern West Texas.

Terrell County . . . In this same geological area, Magnolia Petroleum Co. 1 Brown Bassett was held up by a fishing job at 13,175 ft., total depth. Formation markers released were: Strawn lime 11,435 ft., Mississippi lime 11,540 ft., Woodford 11,584 ft., and the Simpson at 12,562 ft.

Borden County Well Makes Potential

Shell Oil Co. has completed its 1-B J. B. Slaughter estate as an Ellenburger discovery in north-central Borden County, 12 miles north of Gail townsite. Location is approximately NE NE Section 16, Block 30, Township 6 North, T&P Survey.

Final potential was 189 bbl. of oil a day through 6/64-in. choke. Tubing pressure was 915 psi. The flow was natural, from perforations at 8,633-42 ft. Gravity of the oil and gas-oil ratio were not reported.

During drilling, the well also indicated commercial production from several sections in the Pennsylvanian. Drill-stem tests recovered oil at 8,097-8,122 and 8,310-50 ft., and flowed oil on test from 8,350-80 ft.

Midland County . . . Magnolia Petroleum Co. has added a second producer and ½-mile north extension to the Parks (Spraberry) field, 13 miles southwest of Midland.

The firm's 1 Marion V. Benge, 12-40-3S-T&P Survey, made a daily flowing potential of 178.7 bbl. of 38°-gravity oil through 48/64-in. choke, from perforations in the Spraberry at 7,807-7,958 ft. Top of pay was placed at 7,807 ft. on elevation of 2,867 ft. The section was fractured with 30,000 gal.

TEXAS GULF COAST

New Deep Field Opened In Galveston Discovery

Phillips Petroleum Co. has a new gas-condensate discovery well in the Alta Loma-Hitchcock area of Galveston County. It is the company's third successful deep wildcat in the locality this year.

The new well, 1 Thompson Trustee, flowed 562 bbl. of condensate per day

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For Pressures Up To 7500 lbs

FIG. 158

Rated for 7500 lbs at 125F in 2 in. sizes, and for 6000 lbs at 125F in the ½ to 1 ½ in. sizes, Edward's complete line of all forged steel high pressure valves are used in thousands of applications involving excessive pressures and temperatures under 300F. Fig. 158 stop valves, in either globe or angle styles, provide fast, certain shut-off or accurate pressure control. Fig. 160 check valves protect costly equipment, eliminate danger by preventing sudden reversal of flow.

Construction Features Like These Give Longer Life, Reduce Replacement Costs And Lower Maintenance Time:

FIG. 158 STOP VALVES

- Drop forged steel bodies specially heat treated.
- Stem at 60 degree angle to reduce wear producing turbulence, lower pressure drop.
- Seat, disk, and stem of EValloy 13% chromium stainless steel.
- Renewable screwed in seat with long threads below pressure joint for leak proof seating.
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- Stem of EValloy stainless steel, centerless ground to fine finish, long wearing Acme form threads, backseating shoulder.

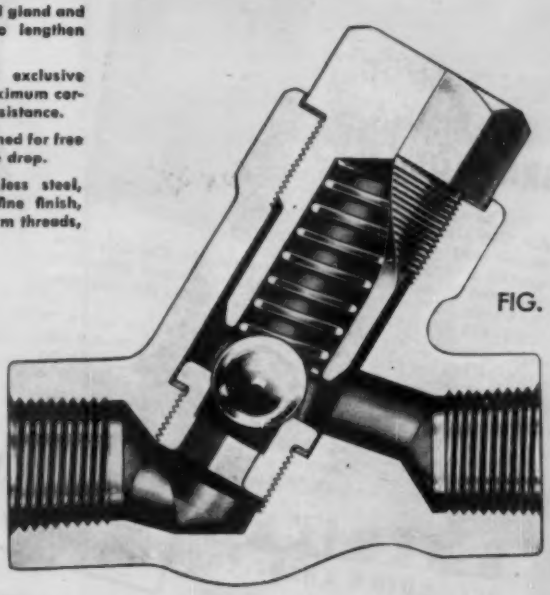

FIG. 160

FIG. 160 CHECK VALVES

- Body and seats identical with globe or angle valves above.
- Rolled steel bonnet with two ribs for guiding ball to accurate seating.
- Balls of corrosion resistant, high carbon stainless steel accurately ground for tight seating.
- High Carbon stainless steel springs, sufficiently long to provide positive aid in seating ball in services involving heavy viscous fluids.

Available in Wide Range of Sizes and Styles

- Stop valves furnished in globe or angle styles.
- Check valves furnished in horizontal or vertical styles.
- All valve styles furnished in sizes ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2".
- All valve styles furnished with either screwed or socket welding ends.

Edward builds a complete line of cast and forged steel valves for pressures from 150 lbs to 7500 lbs, including globe and angle stop valves, gate valves, non-return valves, blow-off valves, feedline stop-check valves, integral bonnet Univalves, relief valves, hydraulic valves, instrument valves, gage valves and strainers. Write for Catalog 104.

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Another Product

through a small choke, and has a calculated open-flow potential of 77,000,000 cu. ft. of gas. Production is from 20 ft. of a 48-ft. sand section topped at 9,090 ft.

Drilled to 11,507 ft., the well logged 23 ft. of additional potential pay in two lower zones.

Location is 3 miles north of Hitchcock field and 10 miles east of the prolific multiple-pay Chocolate Bayou field, in Brazoria County.

The company's other two deep discoveries in the area this year were the 58 per cent interest 1 Sass gas-condensate well, 4 miles southwest, and the 50 per cent interest 1 Sayko dual-zone oil and gas-condensate well, 5 miles west. Phillips' interest in the new well is 57 per cent. It has 11,500 net acres of leases around the three wells.

Newton County Wildcat Showing for Producer

A wildcat located 10 miles southeast of Buna, in southeastern Newton County, is showing for a small gas-condensate well while testing Yegua sand, perforated at 8,478-82 ft.

Tests got a flow of 500,000 cu. ft. of gas with 40 bbl. of 56°-gravity condensate per day through chokes. Pressure was 1,400 psi.

The prospective discovery well was drilled by Kilroy Co. of Texas and Slick Oil Corp. Its location, at 1 Bean, in the John Brooks Survey, is about 3 miles east of the small Dolly field, nearest production. A 9,000-ft. dry hole, drilled by the same companies earlier this year, is about midway between it and the field.

Testing Under Way in Jefferson Wildcat

Meredith & Co. et al will attempt dual completion at the 1 A. P. Daniel, a Jefferson County wildcat 7 miles northeast of the town of Fannett. The operators are testing an upper sand. Perforations at 7,212-17 ft. yielded 140 bbl. of oil per day on ⅛-in. choke.

This new field strike is 1 mile southwest of Hackberry production at Phelan field.

Webster Outpost Gaged In Harris County

Humble Oil & Refining Co. 1 Second National Bank of Houston extends production about 4,400 ft. northwest in Webster Field, Harris County.

The well flowed 16,000 M.c.f. of gas per day from perforations at 4,166-76 ft. on ¼-in. choke. The Frio producer lies in the Dickerson Putnam Survey, A-638, about 2½ miles south of Genoa, and 4,000 ft. northwest of Frio produtcion.

Kin-Ada Field Confirmed In Hardin County

Ada Oil Co. confirmed Kin-Ada field in Hardin County at 1 Kinada-Sternenberg. The well flowed 2,800 M.c.f. of gas per day plus an ungaged flow of distillate from perforations at 6,573-75 ft.

This well confirms new Yegua gas-distillate production. It also is a possible new-pay discovery as the well flowed 21,600 M.c.f. of gas daily plus distillate from perforations at 6,934-47 ft.

The confirmation strike is 2,400 ft. northeast of Ada 1 William C. Kinsolving, a January field discovery in the Yegua at 7,168-75 ft. That one made 8,000 M.c.f. per day.

Second Well Adds New Pay In Commonwealth Field

Commonwealth field, on the north shore of Nueces Bay, west of Portland, in San Patricio County, is getting its second well. It is a northeast offset

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One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101-R3.
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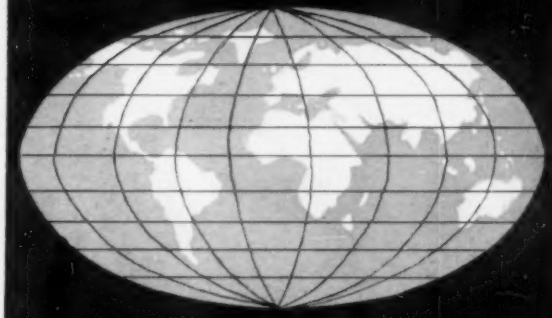

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to the discovery well, completed in September 1956, and, in addition to confirming production in the area, it opens a new pay.

The well, 1 Watson, drilled by Houston Natural Gas Producing Co. and Tidewater Oil Co., is productive of gas and condensate from Frio sand, perforated at 9,636-49 ft. Shut in without gaging, the well's pressure is 3,750 psi. It was drilled to 10,075 ft.

The discovery well, drilled by Marine Gathering Co. at 1 Anderson, is productive of gas and condensate from a basal Frio sand at 9,934-49 ft., 300 ft. below the second well's pay.

WEST CENTRAL

Coleman Wildcat Gets Gray Sand Oil on Test

Bridwell Oil Co. 1 Mary I. Dunman et al "J," northwestern Coleman County wildcat, recovered 40 ft. of heavily oil and gas-cut mud on drill-stem test of the Gray sand at 3,766-76 ft. Another test at 3,774-81 ft. got 25 ft. of oil, 60 ft. mud-cut oil, and 17 ft. of oil-cut mud. Location of this prospect is 3 miles northwest of the town of Novice and 2 miles northwest of Novice-Multipay field in Section 3, BS&F Survey.

Strawn Oil Flows at Nolan County Wildcat

Monterey Oil Co. has an apparent Strawn oil discovery in south-central Nolan County, 9 miles northwest of Blackwell. It is the 44-115 Emily A. Bridgford in Section 115, Block 1-A, H&TC Survey. The operator is coring ahead after flowing oil on a test in the Strawn reef at 6,070-6,118 ft. The well flowed to pits for 30 minutes at the estimated hourly rate of 50 bbl.

North Offset Discovery Completed in Nolan

TXL Oil Corp. 1 Nolan "C" Fee, north offset to Champlin & Caraway 1 Beckham, a Strawn and Ellenburger discovery, was completed flowing 211 bbl. of oil per day on 17/64-in. choke in the Ellenburger at 6,224-48 ft. Location is in Section 69, Block 20, T&P Survey, 6 miles southwest of the town of Trent.

SOUTHWEST TEXAS

Cockerham Field Adds Second Oil Producer

San Patricio County's Cockerham field, west of the town of St. Paul,

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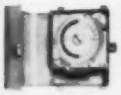

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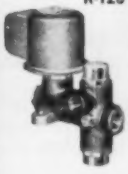

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added its second oil well. The new addition is C. C. Winn 1 Dr. L. Cockerham in Section 18, George H. Paul Subdivision, Welder Ranch. The well flowed more than 120 bbl. per day on ½-in. choke from perforations at 5,836-44 ft., but no official gage has yet been made.

● L. G. Shelly, Thomas Brothers, and H. J. Shearer, will drill a northeast stepout well at Cockerham field. The new try will be 1 Carl Randolf in Section 19, George H. Paul Subdivision, J. J. Welder Ranch. The well will go to 6,500 ft. with the field pay expected at 5,850 ft.

Starr County Extends Shallow Hockley Trend

A north stepout along the new shallow Hockley trend northwest of Rio Grande City in West-Central Starr County has resulted in another small discovery.

It is by Ewing A. Branham at his 1 Adolfo Moreno, in Porcion 71, completed pumping 60.49 bbl. of oil per day from pay at 739-42 ft.

Location is 4,000-ft. north of the one-well Allen field, productive from the shallow Hockley zone. Shallow Hockley production has been found at two other spots farther south along the trend, now stretching about 2 miles. Those spots have been set up as the Alvarez and Reyna fields.

Ben Santos Gas Discovery Confirmed by Second Well

Benedum-Trees Oil Co. is completing its second well in its Ben Santos field, northeast of Realitos, in southern Duval County. It confirms the Cole sand gas discovery made a year ago in the company's 2 Leroy Denman.

The new well, testing open hole at 3,963-65 ft. in the discovery well's pay zone, flowed an estimated 1,000,000 cu. ft. of gas per day through ¼-in. chokes. Bottom-hole pressure was 1,615 ft. flowing, and 1,855 ft. shut in.

Location is 933 ft. south of the discovery well on the same lease. The new field is southwest of Longhorn field.

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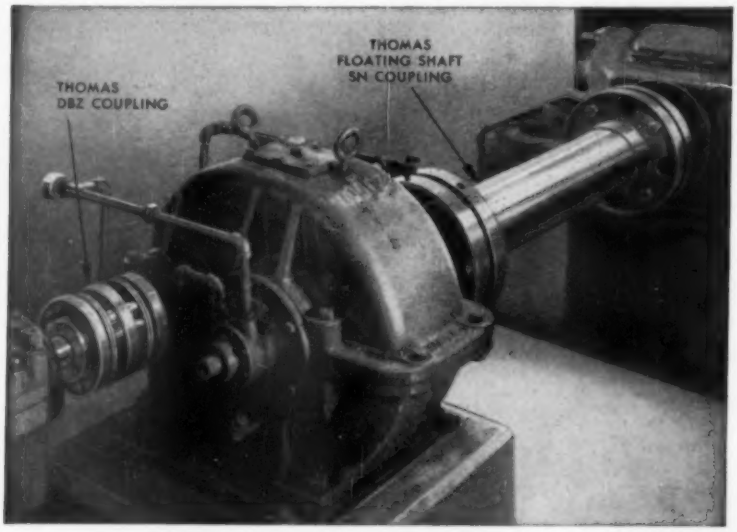

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BOOKS

GUIDES FOR DEVELOPMENT OF IRRIGATION WELLS NEAR CLAYTON, UNION COUNTY, NEW MEXICO, by Brewster Baldwin and F. X. Bushman. Published by New Mexico Institute of Mining and Technology, and State Bureau of Mines and Mineral Resources.

This report summarizes ground-water conditions in Clayton and Seneca 15-minute quadrangles. The text emphasizes the way well data can be used. Technical data are presented in figures and tables. Geologic formations include basalt flows and the Ogallala formation of late Cenozoic age; Graneros shale and Dakota group sandstone and shale, of Cretaceous age; Morrison formation and Exeter sandstone, of Jurassic age; and Dockum group, of Triassic age.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Successful Wildcats

OHIO

Ashtabula County: Benedum-Trees 1 Scribner, Lot 26, Monroe Township. IP 151 BOPD, Clinton 3,332-53 ft. TD 3,440 ft.

Coshocton County: Roberson Oil Co. 1 Verne Boyd, Lot 17, Keene Township. IP 47 BOPD, Clinton 3,883-3,950 ft. TD 4,014 ft.

Stark County: Ohio Fuel Gas Co. 1 Earl Reichenbach, Section 21, Tuscarawas Township. IP 135 M.c.f. of gas per day, Clinton 4,131-69 ft. TD 4,238 ft.

WEST VIRGINIA

Randolph County, Dry Fork district: Hope Natural Gas Co. 10077 U.S.A. Dept. of Int., elevation 3,333 ft., 2,014,000 cu. ft. gas after fracture in Oriskany sand, chert 5,466 ft., gas 5,493 ft., Oriskany sand 5,617 ft., gas 5,645, 5,734 and 5,793 ft: TD 5,968 ft.

ALBERTA

Amerada Crown et al 15-18 Willesden Green, LSD 15, 18-43-6w5. TD 5,787 ft. Cardium oil well.

Pan American A-1 East Saddle Hills, LSD 11, 33-75-7w6. TD 7,875 ft. Vermo-Penn gas well.

SOUTH LOUISIANA

Allen Parish: Carolina Hunt Sands 1 Broussard, 9-5s-4w (3 miles northeast of Pilgrim Church field). IP 33 BOPD and 975 M.c.f. daily, 5/32-in., 53.5°, TP 2,020 psi., perforations 9,240-46 ft. TD 9,500 ft. (New field.)

LOUISIANA OFFSHORE

Lafourche Parish: Sinclair Oil & Gas Co. 3-A OCS-0605, Block 86, South Timbalier area, Gulf of Mexico. IP 435 BOPD, 5/32-in., 35°, GOR 691 cu. ft. per bbl., TP 2,300 psi., perforations 13,184-94 ft. TD 14,100 ft. (New pay in South Timbalier Block 86 field.)

Terrebonne Parish: Shell Oil Co. 1 OCS-0587, Block 139, Ship Shoal area, Gulf of Mexico. IP 168 BOPD and 2,543 M.c.f. daily, ¼-in., 61.4°, TP 2,050 psi., perforations 12,768-82 ft. TD 15,006 ft. (New field.)

MICHIGAN

Arenac County: Carlson and Sowle 1 Nigl, SW SE NE 18n-4e, 3 miles southeast Adams field. IP 3 BOPD. Traverse lime 1,993 ft., pay 2,017-18 ft. TD 3,062 ft. PB 2,018 ft. (New pool). OWWO.

SOUTHEAST NEW MEXICO

Lea County: Atlantic Refining Co. 1-AE State, 36-8s-36e, 6 miles southeast Milnesand. IP 359 BOPD, ¼-in., 47°-gravity, Pennsylvanian 9,650-62 ft. TD 9,750 ft.

NORTH TEXAS

Archer County: E. B. Clark Drilling Co. 1-M Morbitzer, 38-3-Clabk & Plumb, 2 miles S Scotland. IPP 102 BOPD, 44°-gravity, GOR 300, Mississippian 5,597-5,700 ft. TD 5,872 ft.

Jack County: Warren Petroleum Corp. 8 Billie Yates, M. A. Barker Sur., A-1783, 1 mile east Wizard Wells. IP 156 BOPD, 18/64-in., 42°-gravity, GOR 722, TP 300 psi., Caddo 4,702 ft. TD 4,724 ft.

Young County: Kenneth J. Rich 1-A Mathews, J. L. Heighton Sur., A-2162, Strawn discovery in Ken-Rich field, 6 miles northeast Graham. IP 144 BOPD, 15/64-in., TP 125 psi., GOR 450, Strawn 3,178-83 ft. TD 3,685 ft.

Louis Pitcock 2 Atwell estate, Sec. 3412, Blk. 6, TE&L Sur., 6 miles north Graham in gas area. IP 120 BOPD, 42°-gravity, GOR 450, pay 3,040-54 ft. TD 4,800 ft.

SOUTHWEST TEXAS

Hidalgo County: Slick Oil Corp. and Harrell Drilling Co. 1 Frank Schuster, Lot 1, Block 6, Alamo Sugar Co. Subd., Porcion 74, Agostadero Del Gato Grant, IP 163.23 BOPD, 3/16-in., 62°, GOR 2,550 cu. ft. per bbl., TP 475 psi., perforations 5,280-90 ft. (Frio). TD 8,700 ft. (New field.)

Maverick County: Texas Seaboard Oil Co. 1 Ewing Halsell, NCT-A-3, Section 105, Block 6, I&GN Sur., A-711 (10 miles southeast of Eagle Pass). Shut-in gas well, no gage, perforations 627½-29 ft. (Olmos sand). TD 1,568 ft. (New field.)

San Patricio County: Wynne-Hedge-Wynne 1 Hogue, Section 58, G. H. Paul Sub., Fulton Pasture Co. Lands (3½ miles southwest of Taft). IP 11,500 M.c.f. daily, open-flow potential; shut-in tubing pressure 2,360 psi., perforations 5,261-63 ft. (Frio). TD 7,506 ft. (New pay in unnamed area.)

Starr County: Sun Oil Co. 21 C. L. de Garza Heirs 03094, Share 13, La Sal Colorado Grant (32 miles northeast of Rio Grande City). IP 177.17 BOPD, 9/64-in., 42°, GOR 874 cu. ft. per bbl., TP 825 psi., perforations 6,483-92 ft. (Vicksburg), and (dual completion) 126.72 BOPD, 9/64-in., 43°, GOR 1,032 cu. ft. per bbl., TP 690 psi., perforations 5,554-60 ft. (Frio). TD 6,700 ft. (New pay in North Sun field.)

Wood Brothers & Langham 1-C Wood, Porcion 84 (3½ miles northeast of Rio Grande City). IPP 41.25 BOPD, 22°, perforations 1,462-67 ft. (Frio). TD 1,855 ft. (New pay in Gregg Wood area.)

Wood Brothers & Langham 1-B G. P. Wardner, trustee, Portion 84 (4½ miles northeast of Rio Grande City). IPP 45.37 BOPD, 23?, perforations 1,820-25 ft. (Frio). TD 1,870 ft. (New pay in El Tanque field.)

TEXAS GULF COAST

San Patricio County: C. C. Winn 1 Cockerham, Sec. 18, George H. Paul Subd., Welder Ranch. IP 125 BOPD, ⅛-in., 37.1°, GOR 515 cu. ft. per barrel, TP 675 psi., perfs. 5,836-44 ft. (Frio). TD 6,050 ft. (New pay and second well in Cockerham field.)

Wharton County: Anderson & Cooke 1 Stehno-Tucker, S. P. Middleton Sur., A-265 (2 miles north of Louise). Shut-in gas well, no gage. TD 5,600 ft. (New reservoir in Menefee area.)

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A.A.P.G. Schedules Morrow Symposium for Meeting

Tulsa, November 1

By Norman S. Morrisey
Drilling-Development Editor

A SERIES of three papers on the Morrow rocks will be presented Friday, November 1, 1957, at the Mid-Continent regional meeting of the American Association of Petroleum Geologists in Tulsa. The symposium is particularly timely, as the Morrow in the Oklahoma and Texas panhandles and in southwestern Kansas has become a prolific gas and oil producer, and is currently one of the hottest plays in the Mid-Continent area.

Charles H. Glidden and W. Martin Borg of Union Oil Co., in Tulsa will discuss "The Morrow Formation of Northwestern Oklahoma." They will outline the distribution, thickness, and structure of the Morrow formation and show maps and cross-sections. They state that very few wells that have drilled the entire Morrow section have failed to encounter shows.

Charles H. Glidden is division geologist with Union Oil Co. of California. He is a graduate of the University of Oklahoma. W. Martin Borg attended Bethany College in Lindsborg, Kans., and graduated from Kansas State College at Manhattan. He is currently located in Tulsa with Union Oil Co. of California.

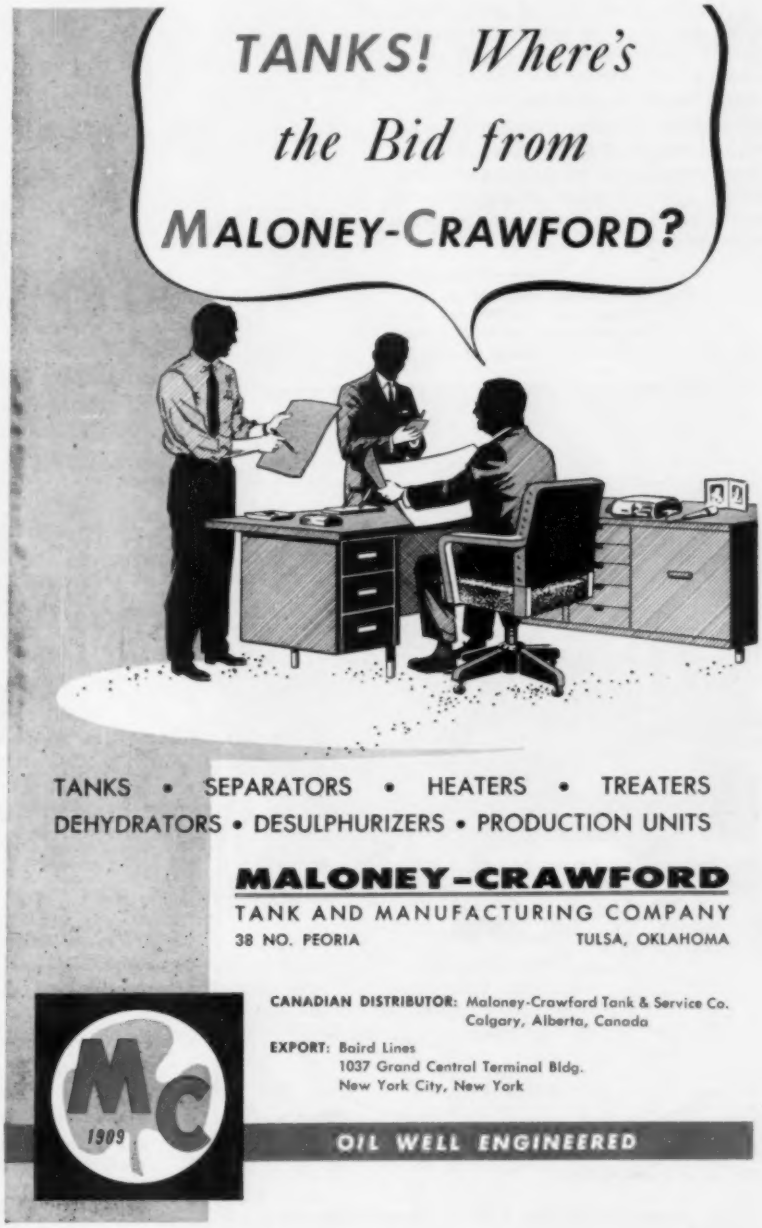
The Liberal Geological Society of Liberal, Kans., has jointly prepared a paper titled "Morrow Rocks of Western Kansas and Panhandle Counties of Oklahoma." The paper will be given by Victor J. Veroda.

Morrow pools . . . Veroda will show examples of the types of oil traps which are found in the 60 Morrow pools in the area. These traps range from simple anticlines to complex stratigraphic traps. The wells are commonly completed through casing with fracture treatment following a light mud acid wash. The depth necessary to test the Morrow ranges from 4,600 to 8,500 ft., and the average cost of wells is from $10 per foot dry to $15 per foot completed. The pay thickness varies from 3 to 40 ft. with average porosity of 14 per cent and connate water content 25 per cent.

The reserves in place are estimated to be from 300 to 750 M.c.f. of gas per acre ft. and 400 to 750 bbl. of oil per acre ft. Reservoir engineering studies indicate that secondary recovery methods will increase the ultimate yield.

Victor J. Veroda is a graduate of Oklahoma University and is district geologist for Republic Natural Gas Co. at Hugoton, Kans. He is a past president of the Liberal Geological Society.

Texas Panhandle . . . A discussion of the Morrow stratigraphy and production in the North Texas Panhandle will be coauthored by Richard L. Parker and George Dobervich. They will cover an area in the Texas Panhandle bounded on the south by the Amarillo



uplift and on the west by the Sierra Grande uplift.

Parker is a 1952 graduate of Stanford University and is secretary-treasurer of Petroleum Exploration, Inc., of Amarillo, Tex. He is also a director of the Geological Sample Log Co. of Farmington, N. M.

Dobervich is a consulting geologist in Amarillo, Tex.

Mountain front paper . . . A. R. Edwards, Oklahoma division stratigrapher for Shell Oil Co., will present a discussion of the sedimentary facies variations in Pennsylvanian sediments along the north flank of the Wichita Mountains.

Edwards shows that the sedimentary rocks near the front are mostly coarse-grained granite-wash rocks with lesser amounts of arkosic sandstones, silty shales, and argillaceous limestones. These beds interfinger basinward with normal marine sandstones, shales, and limestones. Lateral variations also occur which show a close relationship to source rocks from which the sediments were derived.

This is Morrow country—an area that several years ago boasted only Permian gas is now one of the country's hottest development stories.

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EIGHT BULLETS FIRED SIMULTANEOUSLY EXPLODED THE BLOCK! Five bullets fired, one at a time, into a second block produced numerous fracture patterns . . . some as much as ten inches back from the pipe. The target was pulverized in the vicinity of the bullet and dye coloration indicated interconnection between adjacent perforations.

EIGHT SHAPED CHARGES WERE FIRED INTO THIS BLOCK WITH NO EXTERNAL DAMAGE. After opening the block, excellent penetration . . . eight or more inches . . . was observed. There was no fracturing.

EXPERIMENTS IN CONFINED TARGETS SUBSTANTIATE THE EVIDENCE. Tests were also made in 14" Berea Sandstone cores encased in 4½" drill pipe. A single shot—bullet or shaped-charge—was fired through a steel plate into the core. Two out of three bullets produced fractures to the end of the core. None of the shaped charges developed fractures.

Motion pictures were taken of the tests which give graphic proof of the results. You may see the film upon request.

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RETIRING PRESIDENT Jack Abernathy, left, congratulates new officers J. U. Teague, center, and Frank Frawley at convention where . . .

Teague Named By A.A.O.D.C.

THE NEW PRESIDENT of the American Association of Oilwell Drilling Contractors, J. U. Teague of Houston, is a hard-bitten realist.

Teague was elevated to the drilling association's highest office last week at the A.A.O.D.C. national convention in Tulsa. Frank E. Frawley, president of Frank E. Frawley Drilling Co. of Tulsa, was named national vice president.

"I have no secrets for being a successful drilling contractor in 1958," Teague told his colleagues. "All I know is for contractors to work harder."

According to Teague's definition, working harder means closer attention to bidding for wells, getting and keeping trained personnel, doing a better job of administration, and merchandising contracting services.

Efficiency will be the key to staying in business over the next 4 or 5 years, he thinks. He feels that size of the contractor will not be a determining factor for success.

"Our big job as contractors still will be to offer the oil operators the best drilling service at the lowest profitable price possible," Teague says.

The plight of the drilling contractor, he says, is familiar to nearly everyone now. A temporary oversupply of oil has cut into the number of wells to be drilled. An oversupply of drilling tools has made competition extremely heavy for the jobs available.

"The long-range projections in our business look good. That is, if the economists know what they are talking about. But our immediate job is living until these predictions come true. That means tomorrow is our immediate problem."

His new role . . . Teague said in an interview he doubts that temporary attractions of foreign drilling or offshore work will solve many problems for the domestic drilling contractor.

The large sums poured into foreign concessions by American oil companies have had their effect on domestic drilling, and this trend has reduced the amount available for domestic exploration, he said. As a result some American drilling contractors have started moving rigs abroad to share in the lucrative work.

But Teague agrees with Jack Abernathy, outgoing A.A.O.D.C. president, that the foreign-drilling lure likely will prove as temporary as offshore work has done.

Both men point out that offshore drilling now has become competitive. On the average nearly 25 per cent of the drilling equipment available for work in the tidelands is idle. This is vastly different from only a few months ago when operators were clamoring for rigs.

Several factors are responsible, they say. The tidelands-boundary dispute has added to uncertainty offshore. Allowables have not been satisfactory. Problems in gathering and moving the oil and gas have slowed development. But the main factor has been the ever-increasing number of drilling tools moving into the offshore market.

Teague and Abernathy both predict that foreign drilling will follow a similar course and leave domestic drillers facing their old familiar problems.

The new president declared the A.A.O.D.C. organization can play a big role in helping the contractor. "It can't make a good contractor out of a bad one. But the A.A.O.D.C. can acquaint a member with the trends, give him information on costs, training, and technical developments to make him more efficient if he wants to be.

"My goal is to make membership in A.A.O.D.C. a badge of quality. When it's displayed, the operator knows it's worth something in better service."

Veteran driller . . . Teague will assume office January 1, 1958, for a 1-year term.

The new drilling chief is a veteran member of A.A.O.D.C. and an old hand in the oil business.

He has been chairman of the association's rotary drilling committee for 3 years, chairman of the Houston chapter, vice president of the Gulf Coast area, and a director before becoming national vice president last year.

Teague got into the oil business in 1930 after he was graduated from Rice Institute, Houston. He worked with Humble Oil & Refining Co. for 10 years as a petroleum engineer, leaving there to join Hogg Oil Co. He took off 3½ years during World War II for service in the Navy. He organized Columbia Drilling Co. in 1949.

Other officers . . . Besides Teague and Frawley, other incoming A.A.O.D.C. officers are Ray Wiley, Carmi, Ill., vice president cable tools; Don Johnson, Midland, Tex., vice president New Mexico and West Texas; J. O. McFaddin, Los Angeles, vice president California; Don Slape, Olney, Ill., vice president Illinois, Michigan, Indiana, and Kentucky; B. A. Wales, Refugio, Tex., vice president Gulf Coast.

Lloyd E. Pickrell, Wichita, Kans., vice president central Mid-Continent; Guy E. Keith, Casper, Wyo., vice president Rocky Mountains; J. J. Harrigan, Oklahoma City, vice president well servicing; Herbert Woolf, Tyler, vice president East Texas and Louisiana; B. F. Gilchrist, Abilene, vice president North and West Central Texas; W. L. McClusky, Dallas, secretary-treasurer; Brad Mills, Dallas, executive vice president; and Marion S. Church, Dallas, general counsel.

Personals

W. W. CLAWSON

William W. Clawson, coordinator of domestic production for Socony Mobil Oil Co., Inc., is transferring to Magnolia Petroleum Co., Dallas, effective December 1, to coordinate that company's exploration and production activities. Clawson was with Magnolia from 1933 to 1952, the last 6 years as chief geologist, before being named manager of Socony Mobil's Pegasus division in Billings, Mont., and president of Socony-Vacuum Exploration Co. In 1955 he also was named president of Mobil Producing Co., when that firm was incorporated to take over the operations of the Pegasus division.

L. S. Baldin, S. R. Fleming, and **W. O. Johnson** have been elected vice presidents of Ford, Bacon & Davis, engineering-construction firm. Fleming, manager of the Vancouver office, has also been elected vice president of Ford, Bacon & Davis Canada, Ltd., a subsidiary.

Paul G. Bissiri, materials and standards engineer at Union Oil Co.'s Los Angeles refinery, has been transferred to the company's Santa Maria refinery, Arroyo Grande, Calif., as supervisor of technical services. At Santa Maria he succeeds **David Davidson,** who has been assigned to the Los Angeles refinery as a staff engineer in the distillation and alkylation department.

J. E. Dennis has joined Southern Minerals Corp. as district geologist in Corpus Christi, Tex. Dennis was formerly with Pan American Petroleum Corp. in Houston. **J. E. Gordon, Jr.,** formerly with Standard Oil Co. of Texas in Houston, has also joined Southern Minerals' geological department, Corpus Christi.

Frank P. Castleberry, formerly regional land manager for Atlantic Refining Co. at Midland, Tex., has been named manager of the company's new district land and exploration office in Calgary. **Hugh McCain** and **Julius Babisak** have been transferred from Billings, Mont., to Calgary as district geophysicist and district geologist. Staff geologists for the new office will be **Fred Hilderbrand** and **Ron Hartwell,** formerly of Billings and Tyler, Tex., respectively.

Lowell E. Bogart has resigned as photogeologist for Standard Oil Co. of Texas in Midland, Tex., to become a partner in Beard & Bogart, Albuquerque consulting photogeology firm.

Robert Wesselhoeft, Jr., staff geologist with Drilling & Exploration Co., Inc., has resigned to become a consultant. He will be associated with A. B. See Drilling Co., Inc., Abilene, Tex.

Frederick L. Becker has joined Gulf Research & Development Co. as a research engineer in the production engineering division. A graduate of Pennsylvania State University, Becker was recently released from military service.

Donald G. Sarber, Sinclair Oil & Gas Co., has been elected president of North Dakota Geological Society. Other officers are **Stephen H. Harris,** Harris & Brown, vice president; **Jack B. Mills,** The Texas Co., secretary; and **Norman C. Knapp,** Mobil Producing Co., treasurer.

Sie L. Creech has been promoted by Texas Eastern Transmission Corp. from superintendent of maintenance to field superintendent of the company's Little Big Inch division. Creech formerly was superintendent of Triangle Pipeline Co. when that firm was acquired by Texas Eastern in 1954. He was promoted to maintenance superintendent in 1956.

David E. Powley, division geologist for Pan American Petroleum Corp.'s Canadian division, has been appointed district exploration superintendent for the Calgary district, which includes operations in Alberta, Saskatchewan, and Manitoba. **John C. Meeker,** district geologist in Lafayette, La., will succeed Powley as division geologist.

C. B. Webster, president of C. B. Webster Drilling Co., has received the American Association of Oilwell Drilling Contractors' president's award for the outstanding leadership within A.A.O.D.C. The award was presented at A.A.O.D.C.'s annual meeting last week in Tulsa. Webster is president of the association's Houston chapter this year. **Austin W. Mosley,** Southland Drilling Co., was presented a special award for outstanding service as chairman of the San Antonio, Tex., regional chapter, at the meeting. In a third A.A.O.D.C. award, **W. P. Woods,** Oil Production Maintenance, Inc., was cited for his drilling safety record during the past year. Woods received a similar award at the twelfth annual drilling industry safety clinic several months ago.

William Singley, production engineer with Skelly Oil Co., has been transferred to Sweetwater, Tex., from Carthage, Tex.

V. L. King, Jr., has joined Shell Oil Co. as junior exploitation engineer in Houston. **L. J. Stewart, Jr.,** has joined the Houston office as junior geologist.

Jack E. Small, formerly consulting geologist, has joined Development Associates, Inc., Alton, Ill., producing company, as executive vice president and a director.

George R. Locker, unit reservoir engineer for Monterey Oil Co. in the Fullerton Clearfork unit, Hobbs, N. M., has joined Fitting & Jones, engineering and geological consultants in Midland, Tex.

Fred H. Moore, general manager of Mobil Oil of Canada, Ltd., for the past year, has been named coordinator of domestic producing operations and a member of the producing committee of Socony Mobil Oil Co. He will headquarter in New York. **Arthur O. Detmar,** vice president and a director of Mobil Oil of Canada, will succeed Moore as president and general manager of the company. Moore joined

FRED H. MOORE

A. O. DETMAR

Magnolia Petroleum Co., Socony's southwestern affiliate, in 1935. He was assistant to the president of Magnolia before transferring to Mobil of Canada in 1956. Detmar began with Magnolia in 1939. He was appointed assistant exploration manager of the Canadian company in 1952, exploration manager in 1953, and vice president in 1954.

J. C. Cooper, Continental Oil Co.'s Casper, Wyo., division geologist, has been promoted to assistant regional geologist with headquarters in Fort Worth, a new position. **W. H. Fitzgerald,** division geologist in Amarillo, Tex., has been promoted to regional research geologist. Fitzgerald succeeds **C. D. Vertrees,** who has retired. **J. L. Deffenbaugh,** geologist in Roswell, N. M., will replace Fitzgerald in Amarillo. **L. A. Dinges,** geologist in Midland, Tex., has been promoted to assistant division geologist there.

Personals

J. M. HOUCHIN

John M. Houchin, vice president of Phillips Petroleum Co. in charge of production and foreign departments, has been elected a director of the company. On the Phillips board he replaces **C. R. Musgrave,** vice president in charge of supply and transportation, who has retired after 35 years with the company. **D. M. McBride** will be in charge of all supply and transportation activities. McBride has been manager of Phillips' supply and transportation department since 1955. Houchin joined the company in 1933. He was named general superintendent of the production department in 1951, chairman of operating committee in 1956, and was elected a vice president earlier this year. Musgrave has been a vice president since 1930. In 1942 he was elected a director and member of the executive committee.

John Auten, drilling superintendent for Rutledge Drilling Co., has been transferred to Santa Fe from Farmington, N. M.

Clark H. Craft has been appointed chief engineer of Texas Eastern Corp.'s Little Big Inch division. **Ralph W. Howe** has been named superintendent of measurement for the division.

A. D. Reidile, formerly with Shell Development Co., has joined Phillips Petroleum Co. in Bartlesville, Okla., as staff assistant in the process development division.

James O. Staggs, McAlester Fuel Co., has been elected president of the Billings, Mont., Geological Society. Other officers are **Willis H. Alderman** and **H. L. Ambler,** vice presidents; **Phil A. Mundt,** secretary; and **Carlos J. Barkley,** treasurer. **Jack W. Nordquist** and **Emerson K. Beekley** have been named directors.

Edward Gelus, assistant process development department head at Shell Development Co.'s Emeryville, Calif., research center, has been appointed department head, oil reaction process. Also at Emeryville, **G. E. Liedholm,** assistant department head in process engineering, has been named department head, oil process engineering, and **G. J. Pierotti,** assistant department head in physical chemistry, has been appointed department head, chemical separation.

John Heigl and **Merv Conn** have been appointed research associates with Esso Research & Engineering Co. Heigl joined Esso in 1935; Conn, in 1936.

Clyde M. Rascoe, Midland, Tex., consultant geologist, has transferred his offices to Houston.

J. D. (Mitch) Williamson, staff geologist with Gulf Oil Corp. in Houston, has joined Trunkline Gas Co. there as staff geologist in the production and supply department.

Thomas J. Farrell, Jr., has joined the petroleum division of Union Carbide Corp. in New York City.

Flynt Kennedy has been appointed research chemist in Continental Oil Co.'s petrochemical research division, Ponca City, Okla.

Harold E. Aab, district production foreman, has been transferred by Skelly Oil Co. from Lindsay, Okla., to Farmington, N. M.

Dr. E. B. Evans, chief chemist for Esso Research, Ltd., Abingdon, England, has received the Eastlake Medal of England's Institute of Petroleum. The medal recognizes outstanding service to the institute.

Thomas G. Wise, president of H. Earl Clack, Inc., subsidiary of Husky Oil Co., has been elected a director of Husky. Wise succeeds **Lawrence W. Lee** on the Husky board. Lee, vice president and general manager of Canadian Husky Oil, Ltd., has resigned.

G. A. White, assistant superintendent of Shell Chemical Corp.'s Dominguez, Calif., plant, and **A. W. Fairbairn,** section leader in manufacturing-operations at the company's head office, New York, have exchanged jobs. White had been assistant superintendent at Dominguez for the past 5 years. Fairbairn was appointed section leader in manufacturing - operations last year.

Alvin B. McClelland, Jr., formerly eastern manager with J. F. Pritchard & Co., has been elected chairman of the board and chief executive officer of Siboney - Caribbean Petroleum Co. He succeeds **William H. Garbade,** who has been named chairman of the Siboney executive committee. Garbade is president of Crescent Corp., a large stockholder in Siboney. Siboney has announced plans for a $6-million exploration program in the U. S. and Cuba during the next 5 years.

W. V. PHILLIPS

William V. Phillips has been promoted by Great Lakes Carbon Corp. from assistant general manager of the oil and gas division to general manager. He succeeds **Dr. E. R. Lilley,** who has retired. Phillips joined Great Lakes in 1943 as chief engineer for the oil and gas division. He was appointed assistant general manager of the division in 1948. Phillips will continue to headquarter in Tulsa.

R. A. Howard, formerly with Texaco Exploration Co., has joined Kerr-McGee Oil Industries, Inc., in Calgary.

L. Bruce Forney, staff geologist in Sohio Petroleum Co.'s Gulf Coast division, has joined **P. R. Rutherford,** Houston producer, as geologist.

A. H. Masiran, Corpus Christi and Abilene, Tex., independent operator, has moved his offices to Hoquiam, Wash.

E. L. Emmel, reservoir engineer, has been transferred by Shell Oil Co. from Houston to Midland, Tex. **R. K. Johnson,** exploitation engineer in Houston, has been transferred to New Orleans.

Lewis P. Kilbourne has been appointed manager of operations at the newly opened New Orleans office of Gulf Coast Leaseholds, Inc. A graduate of Louisiana State University, Kilbourne was formerly with a New Orleans consulting firm.

John K. Ontko has been promoted to Calgary regional geologist for Plymouth Oil Co. A graduate of the University of Alberta, Ontko joined Plymouth last year. He was with Pacific Petroleums, Ltd., and Royalite Oil Co., Ltd., before that time.

D. E. Stines, vice president of Creole Petroleum Corp., has been elected a director. Stines joined the parent Standard Oil Co. (N.J.) in 1929. He was head of Jersey Standard's coordination division, coordination and economics department, and vice chairman of the coordination committee for Europe before assignment to Esso Petroleum Co., Ltd., in London in 1955 as special adviser on refining. He was elected a vice president of Creole last year.

Personals

A. L. MARTIN, JR.

Arthur L. Martin, Jr., tool pusher, has been promoted to West Texas-New Mexico division drilling superintendent for Delta Drilling Co. Martin joined Hawkins Drilling Co., which later became Delta Gulf Drilling Co., in 1948. Delta Gulf was merged with its parent company, Delta Drilling, earlier this year. Martin will headquarter in Odessa, Tex.

R. T. Weaver, process engineer at Continental Oil Co.'s Ponca City, Okla., refinery, has been named technologist, catalytic cracking.

M. R. Sheets, process engineer at Continental Oil Co.'s Ponca City, Okla., refinery, has been appointed technologist, thermal cracking.

Herman A. Engel, Jr., technical assistant to the president of Union Oil & Gas Corp. of Louisiana, has been appointed manager of Canadian operations and will open an office for the company in Calgary. Engel joined the company in 1951.

Robin J. Corbett has been promoted by Sharples Oil Corp. from assistant production manager to assistant to the president, a new position. A graduate of Colorado School of Mines, Corbett joined Sharples in 1948 as production engineer.

Dr. Alastair D. Cumming has been appointed chief geologist for Tidewater Oil Co.'s Saskatchewan project. Tidewater is operator in this project for Atlantic Refining Co., Columbian Carbon Co., and Ohio Oil Co. Cumming joined Tidewater earlier this year. He was formerly principal geologist for the Saskatchewan Department of Mineral Resources.

Harry Schafer, Jr., Schafer Drilling Co., has been elected chairman of the central Oklahoma chapter of American Association of Oilwell Drilling Contractors. **W. C. Payne,** Hap Drilling Co., has been named vice chairman for programs, and **Glenn Moore,** Viersen & Cochran, is vice chairman for membership. Other officers are **A. S. Nuckolls,** Nuckolls-Bell Drilling Co., secretary; and **Jack E. Trigg,** Trigg Drilling Co., Inc., treasurer.

Joseph Saxon, Jr., formerly with Ryder-Scott Co., has formed a reservoir engineering consulting firm, Saxon Engineering Co., in Wichita Falls, Tex.

Dorman L. Commons, a director of Douglas Oil Co. of California, has been elected a vice president. Commons joined Douglas in 1947 and has been a director since 1953.

Louis Bales, technologist in catalytic cracking at Continental Oil Co.'s Ponca City, Okla., refinery, has been named process engineer there. **Stuart Hartman,** process engineer, has been appointed director of technical services.

Peter J. Bediz, vice president and general manager of Canadian operations for Century Geophysical Corp., has been elected president and general manager of Century Geophysical Corp. of Canada. Newly elected directors of Century Geophysical Corp. are **John F. Bolger,** president of Shillinglaw, Bolger & Co., Chicago, and **Robert A. Broding,** technical vice president of Century. Broding has been with the company since 1953.

Sidney H. Greenfeld has joined California Research Corp.'s petroleum production division as research engineer.

Richard L. Stamets has joined the staff of the New Mexico Oil and Gas Commission. Stamets was formerly with W. F. Turney & Associates, Santa Fe.

A. Duane Bush, president of Berry Holding Co., has been elected president of Independent Oil Producers' Agency, Los Angeles.

W. Dave Henderson, Midland, Tex., independent operator and consulting geologist, has moved his headquarters to Junction, Tex.

H. L. Crawford has been appointed general superintendent of the special products manufacturing plant and fuel-oil terminals of Humble Oil & Refining Co., Houston. He was formerly chief chemist. **George H. Shipley,** chemical products coordinator in the refining department, has been named coordinator of special products manufacturing and the fuel-oil terminal division.

DEATHS

Melbert E. Schwarz, 59, vice president in charge of oil production for Seaboard Oil Co., Dallas, died October 13 in Garland, Tex. Schwarz had been with Seaboard since 1933. He had worked with Rio Bravo Oil Co. as an engineer from 1924 to 1933 and taught a semester at Texas A. & M. before joining Seaboard. He had served as an officer of the American Petroleum Institute and was given an A.P.I. certificate of appreciation in 1952 for 26 years of distinguished service in the A.P.I.'s Division of Production. He also was a member of Texas Mid-Continent Oil and Gas Association, Society of Petroleum Engineers of A.I.M.E., Independent Petroleum Association of America, and a charter member of the Dallas Petroleum Club.

A. E. (Gene) Fisher, field superintendent for Pan American Petroleum Corp. at West Edmond, Okla., died October 10 in Oklahoma City. He was 48. A graduate of Colorado State University, Fisher worked for Continental Oil Co. before joining Pan American's West Texas operations in 1934. He was field superintendent at Monroe, La., before assignment to West Edmond in 1951.

Stuart Fabian Magor, 69, vice president and a director of Superior Oil Co., died October 11 in Los Angeles.

E. W. Mayo, Sr., 84, editor and a founder of World Petroleum magazine, died October 10 in Westport, Conn. A graduate of Cornell University, Mayo was a staff member of both the old New York Sun and New York Herald before the turn of the century.

John H. White, 63, assistant secretary and purchasing agent for Blanco Oil Co., died October 7 in San Antonio, Tex., of a heart ailment. White had been with Blanco for 21 years. He was with Humble Oil & Refining Co. and Lago Oil Co. before joining Blanco.

Robert B. Pearce, 65, Mount Vernon, Ind., drilling superintendent for Olson Drilling Co., died October 7. Pearce had been with Olson for 23 years.

Roy Yarrington, 67, field superintendent for Stewart Petroleum Co., Galveston, Tex., died October 7 in Galveston after an automobile accident.

Luther Winch, 30, production foreman at Texas-United States Chemical Co.'s Port Neches, Tex., plant, was killed October 9 in a plant explosion.

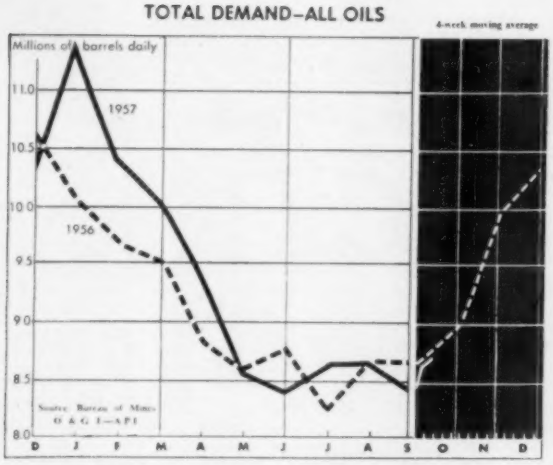
William J. Peterman, Portales, N. M., consulting geologist, died recently. Peterman had been active in eastern New Mexico and Wyoming since 1918.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,740,825	DOWN	62,925	DOWN	214,962
Crude stocks	283,338,000	UP	975,000	UP	6,371,000
Completions	1,178	UP	6	UP	75
Refinery runs	7,744,000	DOWN	35,000	UP	246,000
Gasoline stocks	177,948,000	UP	565,000	UP	3,886,000
Kerosine stocks	35,846,000	UP	71,000	UP	2,282,000
Distillate stocks	172,683,000	UP	1,392,000	UP	19,484,000
Residual stocks	59,041,000	UP	938,000	UP	11,692,000
Four-product stocks	445,518,000	UP	2,966,000	UP	37,344,000
Total imports	1,465,800	DOWN	190,500	UP	272,500

TOTAL DEMAND—ALL OILS



Well Completions Are Down 3,778, But Total for Year May Hit 55,000

CURRENT DRILLING rates point to a total of about 55,000 well completions this year. Through October 12, operators had drilled 42,315 wells. This total includes both wildcat and development drilling.

Drillers have a little more than 11 weeks remaining in the year to complete the 1957 program. For the past 3 weeks, completions have averaged 1,166 wells per week. This rate may hold up for most of the remaining weeks of the year. The exception to this average will come in the last half of December when the holiday season slows down the drilling program.

Even taking into account the poor showing for these late weeks of the year, there is a good chance that the weekly average between now and the end of the year will be at least 1,150 wells.

This rate times the 11 weeks remaining gives a total of 12,650 wells to be added to the cumulative total of 42,315 reported up to October 12. The year's total would be 54,963, or about 500 wells fewer than the Journal's forecast at midyear.

Total completions through October 12 were down 3,778 wells from the same period last year. Oklahoma accounted for 1,561 wells or 41.3 per cent of the total drop in drilling. Illinois is down 999 wells or 26.4 per cent of the total.

Other important reductions were in Kansas, down 655; Kentucky, down 314; Texas, down 308; and Colorado, down 287. Losses in Texas were along the Gulf Coast and in the North Central areas. East Texas is showing a small gain with the remaining increases coming from West Texas and the Panhandle.

The West Texas gain is duplicated by increases across the line in Southeast New Mexico. Completions in Northwest New Mexico show a gain of 44 wells. Utah is up 75 wells.

The drilling trend in the Appalachian area is running counter to the national record. Completions for New York, Pennsylvania, West Virginia, and Ohio total 2,290 wells so far this year compared with 2,110 for the same weeks last year.

Arkansas, where drilling in 1956 topped a thousand wells for the first time since the war, is having another good year with completions ahead of last year by 141 wells.

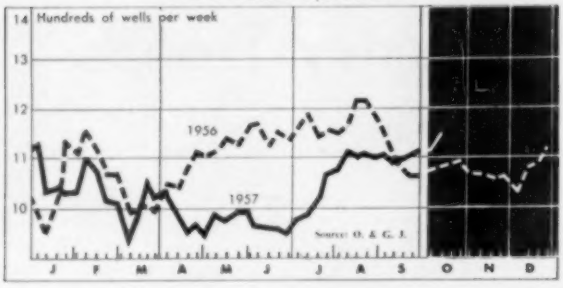
Decreases in North Louisiana more than offset the gains for Louisiana Gulf and Offshore.

Refined-product markets are still soft . . . There has been very little change in product markets over the past week. Refiners have too much gasoline in tanks on the Gulf Coast. There have been no reports of spot sales, but market rumors in the area indicate that a buyer with a tanker ready to load could find 92-octane regular as low as 10.75 cents a gallon.

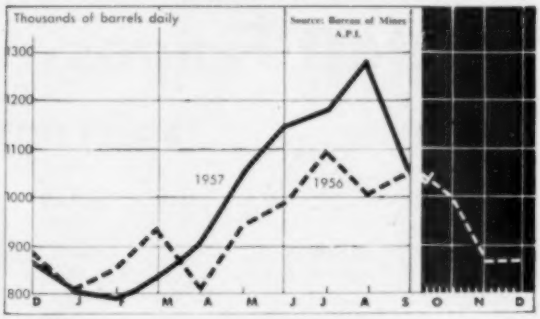
The fact that the heating season is just around the corner is causing a little activity in the distillate market. However, most of the inquiries are reported to be coming from buyers who seem to be fishing for offers at a distress price. There have been rumors that some marketers would take No. 2 at the Gulf Coast if they could get it for 8.0 cents. Some material probably could be found at 8.50 cents.

The tone of the Group 3 distillate market has improved slightly, but this has been due more to time of year than to any big jump in sales.

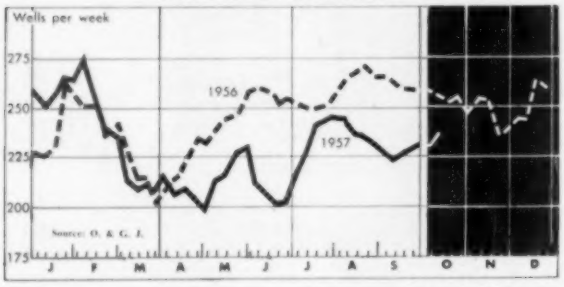
TOTAL COMPLETIONS



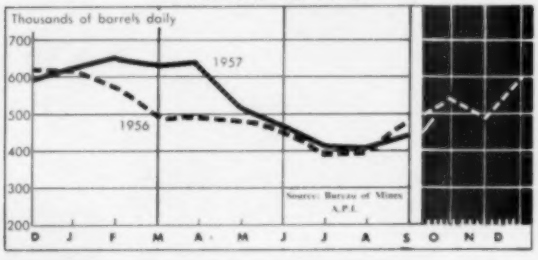
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

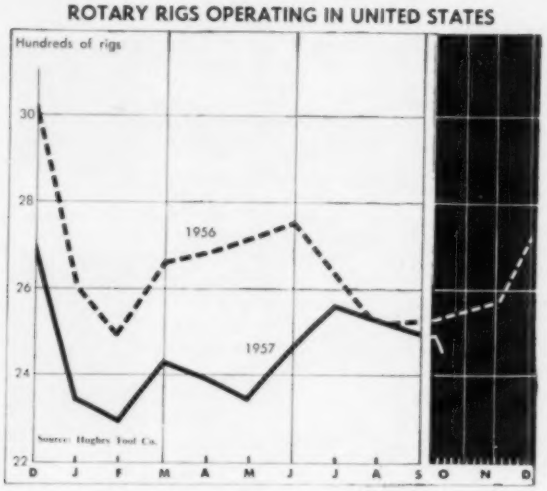


WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 12, 1957

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	0	0	0	0	0	0	0	67	‡84	0	0	0	0	0	21	‡36
Arkansas	11	5	0	0	6	0	45,936	864	723	6	2	0	0	4	163	149
California	42	25	0	1	16	0	183,460	1,714	1,748	11	0	0	0	11	414	413
Colorado	19	1	0	1	17	0	95,014	659	946	15	0	0	0	15	437	502
Illinois	68	26	0	1	41	0	172,272	2,065	3,064	12	0	0	0	12	496	603
Indiana	19	8	0	0	11	0	32,044	511	537	6	1	0	0	5	103	108
Kansas	103	52	0	4	45	2	364,635	3,291	3,946	21	3	0	1	17	661	847
Kentucky	33	15	0	6	12	0	40,933	1,167	1,481	3	0	0	0	3	235	343
Louisiana	55	27	6	2	20	0	408,295	2,988	2,995	15	1	2	1	11	531	601
North	27	14	0	1	12	0	100,453	1,088	1,305	5	0	0	0	5	145	199
South	19	6	6	0	7	0	208,735	1,367	1,362	8	0	2	0	6	320	342
Offshore	9	7	0	1	1	0	99,107	533	328	2	1	0	1	0	66	60
Michigan	8	4	0	1	3	0	25,366	333	349	2	0	0	0	2	120	136
Mississippi	5	0	1	0	4	0	40,070	303	350	2	0	0	0	2	158	170
Montana	19	8	0	3	8	0	76,602	328	360	6	0	0	0	6	127	130
Nebraska	12	5	0	0	7	0	66,522	688	770	6	1	0	0	5	381	374
New Mexico	53	20	0	20	13	0	232,476	1,689	1,491	12	3	0	0	9	223	204
Northwest	31	6	0	19	6	0	140,969	704	660	5	1	0	0	4	86	70
Southeast	22	14	0	1	7	0	91,507	985	831	7	2	0	0	5	137	134
New York	10	4	0	1	0	5	13,238	363	.....	1	0	0	1	0	7	.....
North Dakota	11	4	0	0	7	0	87,393	223	206	5	0	0	0	5	101	61
Ohio	22	10	0	6	5	1	57,236	879	838	0	0	0	0	0	10	10
Oklahoma	234	127	2	8	95	2	763,321	5,032	6,593	25	4	0	0	21	584	697
Pennsylvania	0	0	0	0	0	0	0	517	†744	0	0	0	0	0	39	†20
Texas	414	214	13	17	167	3	1,689,032	17,150	17,458	96	11	1	2	82	4,098	4,443
District 1	22	4	2	3	13	0	68,734	985	*2,490	11	0	1	0	10	336	*859
District 2	16	3	2	6	5	0	93,043	598	*2,073	1	0	0	1	0	210	*688
District 3	20	5	1	2	12	0	145,667	1,345	.....	6	2	0	0	4	380	.....
District 4	26	6	4	0	16	0	152,367	1,116	.....	5	0	0	0	5	363	.....
East	36	21	3	0	12	0	180,322	1,058	917	10	1	0	0	9	305	327
District 7-B	81	40	0	0	41	0	210,447	2,332	.....	25	4	0	0	21	794	.....
West	92	67	1	0	24	0	470,166	4,847	4,670	13	1	0	0	12	691	726
District 9	98	54	0	1	40	3	270,132	3,736	*6,273	22	3	0	1	18	932	*1,747
District 10	23	14	0	5	4	0	98,153	1,133	1,035	3	0	0	0	3	87	96
Utah	10	6	0	0	4	0	58,831	174	99	4	0	0	0	4	87	59
West Virginia	11	2	0	6	3	0	39,522	531	528	1	0	0	0	1	25	19
Wyoming	18	5	0	2	10	1	84,075	665	681	6	0	0	1	5	230	204
Miscellaneous (Nev.)	1	0	0	0	1	0	688	112	70	1	0	0	0	1	95	63
Total United States	**1,178**	568	22	79	495	14	4,576,961	42,313	46,091	**256**	26	3	6	221	9,346	10,192
Total previous week	1,172	606	16	94	429	27	4,769,859	.....	.....	215	21	4	4	186	.....	.....
Cumulative 1957	42,313	21,891	438	3,044	16,062	878	174,708,787	.....	.....	9,346	957	82	318	7,989	.....	.....
Western Canada	50	28	0	3	17	2	251,985	2,419	2,487	17	1	0	1	15	683	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

ROTARY RIGS OPERATING IN UNITED STATES



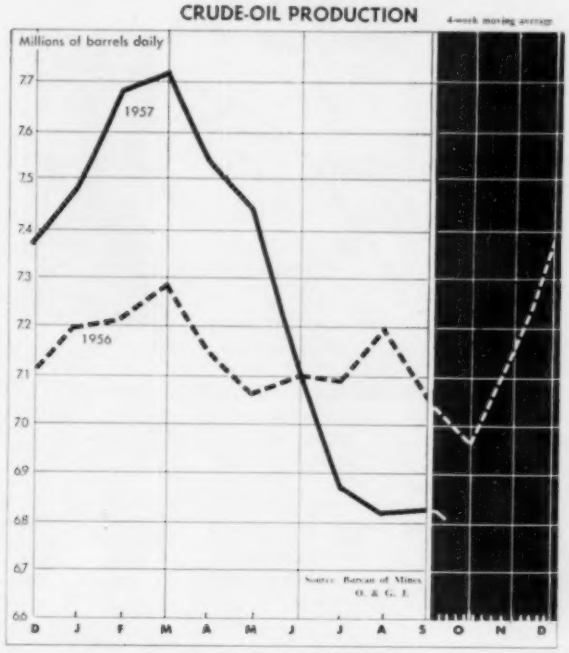
ACTIVE ROTARY RIGS*

Area—	10-14-57	10-7-57	9-30-57	10-15-56
Alabama	4	4	2	8
Arkansas	27	23	27	20
Arizona	1	1	1	
California	90	95	98	117
Colorado	60	56	63	64
Florida	1	1	1	4
Georgia				
Idaho				
Illinois	63	61	63	77
Indiana	11	11	6	14
Iowa	2	2	2	1
Kansas	162	161	151	172
Kentucky	10	10	8	8
Louisiana	432	436	427	421
North	57	56	61	62
South	283	291	276	359
Offshore	92	89	90	(†)
Maryland	1	1	1	
Michigan	11	11	8	17
Missouri				1
Mississippi	41	41	42	32
Montana	40	34	33	48
Nebraska	28	36	36	28
Nevada				1
New Mexico	139	141	148	131
New York				
North Dakota	38	36	40	24
Ohio				1
Oklahoma	251	257	253	274
Oregon	1	1	1	
Pennsylvania	13	11	14	8
South Dakota	1	1	2	
Texas	876	898	852	987
Gulf Coast	178	196	181	239
Offshore	4	4	2	(‡)
West	351	359	349	375
North	283	280	271	305
East	60	59	49	68
Tennessee	1	1	1	
Utah	66	71	68	28
Washington	1	1	1	1
West Virginia	3	3	2	3
Wyoming	78	82	82	75
Virginia				
Total United States	2,452	2,488	2,433	2,565
Western Canada	165	190	194	236
Eastern Canada	3	3	3	
Grand total	2,620	2,681	2,630	2,801

*Hughes Tool Co. †Included with South Louisiana. ‡Included with Texas Gulf Coast.

CRUDE-OIL PRODUCTION

4-week moving average

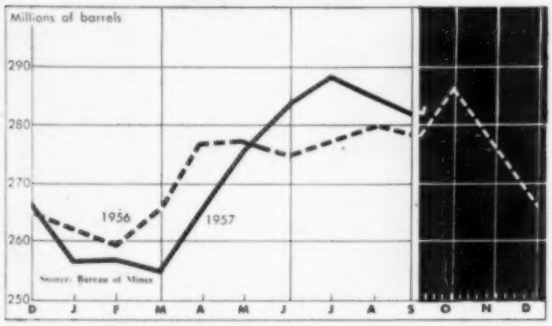


DAILY AVERAGE PRODUCTION FOR WEEK

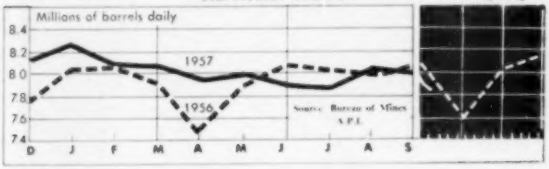
	October 12, 1957			Oct. 5
	Crude oil	Lease condensate	Total	total
Alabama	16,550		16,550	16,275
Arkansas	81,325	300	81,625	81,650
California	931,400		931,400	928,000
Colorado	147,950		147,950	147,400
Eastern	53,200		53,200	53,600
Florida	1,250		1,250	1,225
Illinois	234,600		234,600	227,900
Indiana	36,600		36,600	34,500
Kansas	†330,050		†330,050	†337,200
Kentucky	44,400		44,400	46,000
Louisiana	734,600	77,600	812,200	801,625
North	119,600	2,600	122,200	122,350
South	615,000	75,000	690,000	679,275
Michigan	27,500		27,500	26,000
Mississippi	99,800	4,500	104,300	104,400
Montana	75,250		75,250	74,650
Nebraska	56,750		56,750	56,200
Nevada	150		150	150
New Mexico	249,500	4,300	253,800	253,250
North Dakota	28,650		28,650	32,900
Oklahoma	†545,800		†545,800	†572,400
Texas	2,595,000	55,100	2,650,100	2,703,675
Dist. 1	48,000	500	48,500	49,150
Dist. 2	116,000	8,800	124,800	128,900
Dist. 3	374,000	26,800	400,800	408,950
Dist. 4	197,000	6,300	203,300	207,575
Dist. 5	32,000	300	32,300	33,800
Dist. 6	108,000	5,900	113,900	119,250
East Texas Field	155,000		155,000	161,650
Dist. 7-B	143,000	75	143,075	147,350
Dist. 7-C	138,000	3,875	141,875	143,575
Dist. 8	982,000	1,400	983,400	996,250
Dist. 9	200,000	600	200,600	202,525
Dist. 10	102,000	550	102,550	104,700
Utah	11,700		11,700	11,200
Wyoming	296,800		296,800	293,400
Others	‡200		‡200	‡200
Total U. S.	6,599,025	141,800	**6,740,825**	6,803,800
Change from prev. week, down			**62,975**	
Canada	†405,400		†405,400	†438,600
Total U. S. production—Jan. 1-Oct. 12				2,066,792,600 bbl.
Same period last year, (crude plus cond.)				*2,041,809,397 bbl.

*Includes 35,027,330 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

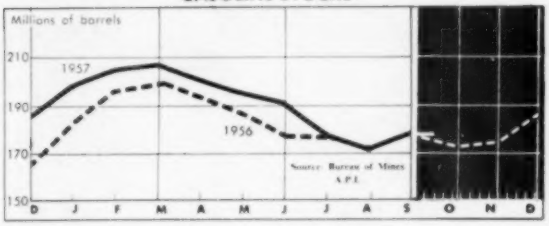
CRUDE-OIL STOCKS



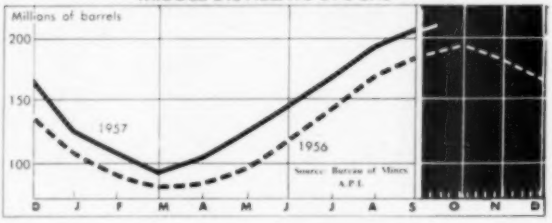
REFINERY RUNS



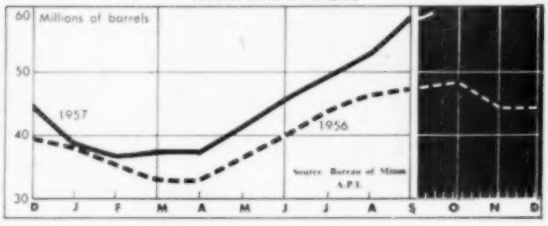
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousand of barrels)

	10-5-57	9-28-57	10-6-56
Pennsylvania Grade	3,074	3,146	2,490
Other Appalachian	1,813	1,812	2,529
Illinois, Indiana, and Michigan	11,169	11,676	11,373
Nebraska and North Dakota	3,308	3,046	2,003
Kansas	10,501	10,399	10,000
Oklahoma	21,246	21,771	24,903
Arkansas	2,493	2,530	2,812
Louisiana	19,567	19,428	18,123
North	3,321	3,243	2,417
South	16,246	16,185	15,706
Mississippi, Alabama and Florida	2,579	3,030	2,948
New Mexico	10,274	10,079	8,439
Texas	127,075	126,462	124,675
East Texas proper	10,400	9,878	9,042
West Texas	58,962	60,068	60,505
Texas Gulf	25,585	24,542	23,261
Other Texas	32,128	31,974	31,867
Wyoming	15,641	15,803	17,165
Other Rocky Mountain	6,098	6,125	6,249
California	31,919	31,627	28,125
Foreign	†16,581	15,429	15,133
Total	283,338	282,363	276,967

*Bureau of Mines. †Includes 4,993,000 bbl. in California.

A.P.I. REFINERY REPORT, OCTOBER 11, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1956 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,083	491.8	33.4	305.6	162.7	43,642	14,187	65,470	14,488	1,235	483.3	30.8	322.6	229.2
Appalachian:														
District 1	111	48.3	6.6	23.9	6.1	4,531	589	3,463	580	102	45.3	2.5	22.3	4.8
District 2	106	54.0	5.4	19.3	11.0	2,443	555	1,392	175	48	26.8	2.4	6.8	7.1
Ind., Ill., Ky.	1,428	727.3	51.7	300.8	159.4	30,107	7,137	24,923	5,958	1,271	662.9	53.8	254.2	139.9
Minn., Wis., Dak.	74	27.3	1.3	26.7	7.3	5,548	1,671	8,175	460	104	48.7	5.6	30.2	8.2
Okla., Kans., Mo.	752	434.3	11.6	182.4	29.1	14,256	1,915	14,155	1,106	728	405.0	11.8	160.3	28.1
Inland Texas	250	205.4	7.4	49.8	22.9	6,668	561	2,946	1,970	278	212.3	8.5	49.6	20.6
Texas Gulf Coast	1,799	954.3	88.4	443.0	225.2	24,186	3,949	20,207	7,840	1,854	904.1	77.6	471.7	241.6
La. Gulf Coast	607	341.3	45.4	159.3	42.9	10,790	3,595	8,972	1,631	668	361.1	45.5	169.0	45.3
N. La. and Ark.	95	27.9	6.9	21.9	5.7	4,416	914	2,236	206	97	34.7	5.6	22.4	6.7
Rocky Mountain:														
New Mexico	28	14.3	0.9	5.9	3.0	386	14	144	70	26	13.7	0.1	6.2	2.3
Other Rocky Mtn.	277	130.0	3.0	61.4	33.7	5,486	350	3,217	968	285	134.1	2.1	61.4	34.6
West Coast	1,134	452.8	3.1	171.6	335.7	25,489	409	17,383	23,589	1,156	500.5	2.7	172.9	321.2
Oct. 11, 1957	7,744	3,909.0	265.1	1,771.6	1,044.7	177,948	35,846	172,683	59,041	7,852	3,832.5	249.0	1,749.6	1,089.6
Oct. 4, 1957	7,779	3,970.4	235.9	1,757.9	1,094.1	177,383	35,775	171,291	58,103	.....	.....	.....	.....	.....
Oct. 12, 1956	7,498	3,772.1	331.9	1,771.7	1,098.9	174,062	33,564	153,199	47,349	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.75
Premium (98 octane)	14.25-14.50
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
Regular (88 octane)	12.9
Premium (96 octane)	14.9
Premium (98 octane)	15.4
Caribbean area (cargoes):	
Regular (87 octane)	10.875
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.0
Breckenridge:	
Grade 26-70	3.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
Kerosine 41-43	10.75
Distillate No. 2	10.25
Diesel fuel, 48-52 d.i.	10.55
Caribbean area (cargoes):	
Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.85
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$2.95
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) (§)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Most buyers are posting Wyoming sour in two schedules, 15°-26.9° and 27°-40°.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.59
Iraq, 36.0°-36.9°, Tripoli, Banias	2.59
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—35%)	$1.85
★ Carib.-Canada, clean (USMC—37.5%)	2.53
★ P.G.-Japan, dirty (USMC—52.5%)	4.28
Gulf-U.S.N.H., dirty (USMC—25%)	2.14

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October 21, 1957

(This statement is published in compliance with the Act of August 24, 1912.)

Published weekly (Monday) at Tulsa, Okla.

Publisher: The Petroleum Publishing Company, Tulsa, Okla.

Editor: Kenneth B. Barnes, Tulsa, Okla.

Business Manager: S. H. Rourke, Tulsa, Okla.

The owner is: The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 1, Okla.

Stockholders holding 1 per cent or more of total amount of stock: Helen B. Lauinger, Tulsa, Okla.; P. C. Lauinger, Tulsa, Okla.; Edward P. Boyle, Oil City, Pa.

Known bondholders, mortgagees and other security holders holding 1 per cent or more of the total amount of bonds, mortgages or other securities: None.

The average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was 37,121.

S. H. ROURKE,
Business Manager.

Sworn to and subscribed before me this 30th day of September, 1957.

ROBERT D. FUNK,
Notary Public.

My commission expires April 19, 1959.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 319.99 acres of land in one parcel within the known geologic structure of Garmesa Field, Garfield County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 pm., M.S.T., November 29, 1957, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. George H. Woodhall, Manager.

LEGAL

SEALED BIDS will be received until 10:00 A. M., Mountain Standard Time, November 5, 1957, and opened at that time in the Office of the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 11,894.06 acres of tribal and allotted Indian lands, located in Roosevelt and Sheridan Counties, Montana, for oil and gas mining purposes. The detail of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone, Poplar, 2161.

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U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 2,056.16 acres of land in thirteen parcels within the known geologic structure of Moffat Field, in Moffat County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T., December 2, 1957, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. George H. Woodhall, Manager.

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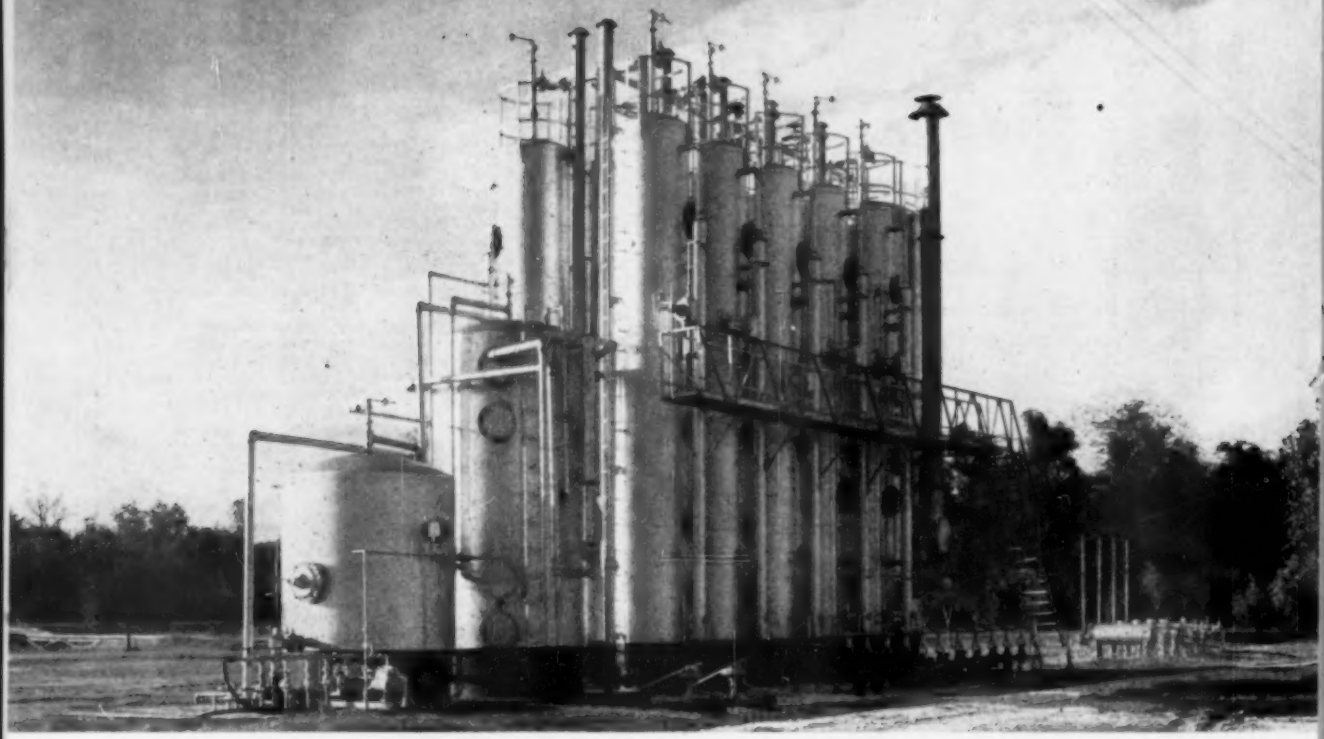

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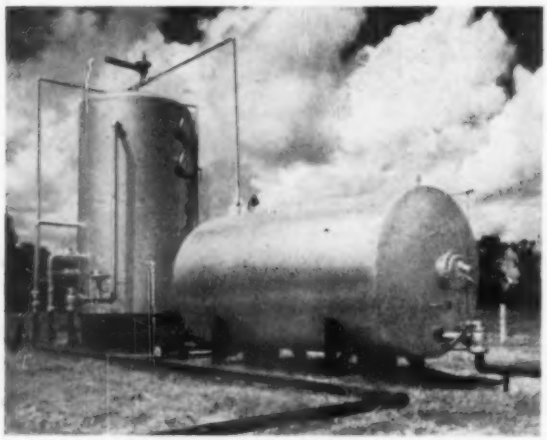

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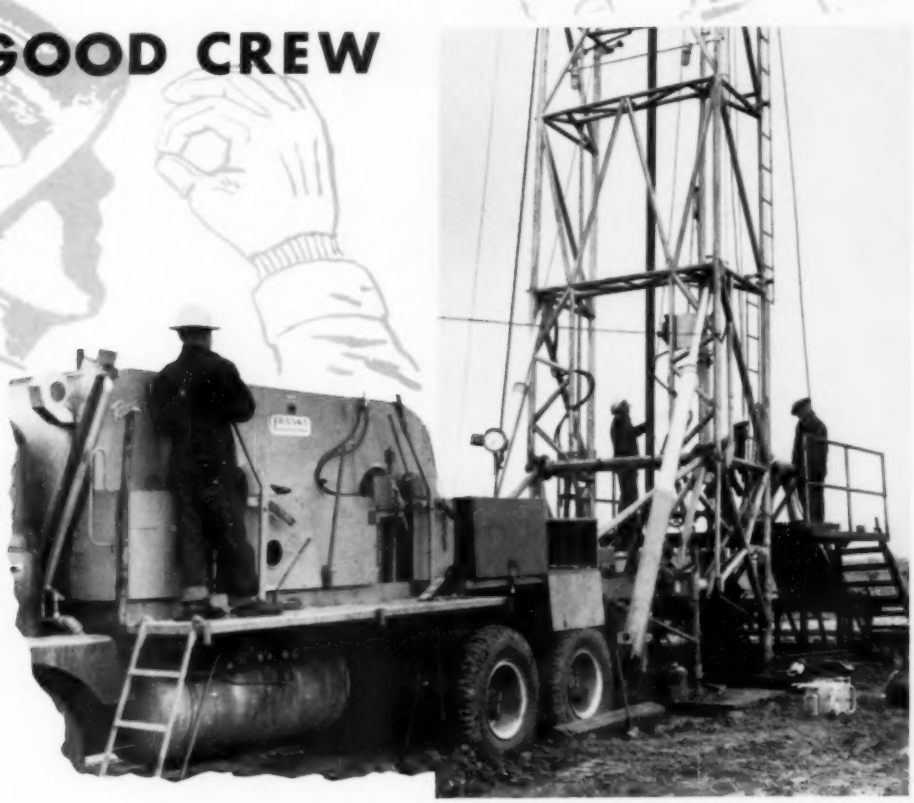

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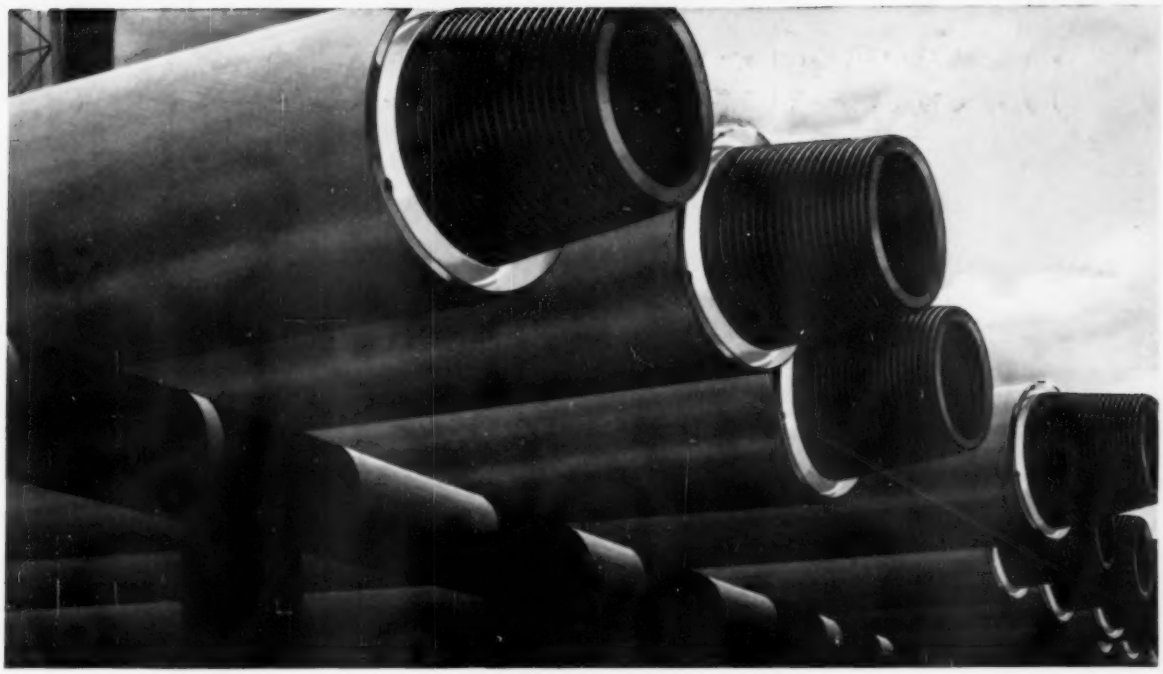

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